FLIGHT

First Aero Weekly in the World.

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport.

OFFICIAL ORGAN OF THE ROYAL AERO CLUB OF THE UNITED KINGDOM.

No. 204. (No. 47, Vol. IV.)] NOVEMBER 23, 1912. [Registered at the G.P.O. as a Newspaper.] [Weekly, Price 3d. Post Free, 3½d.

Flight.

Editorial Office: 44, ST. MARTIN'S LANE, LONDON, W.C.

Telegrams: Truditur, Westrand, London. Telephone: Gerrard 1828.

Annual Subscription Rates, Post Free.

United Kingdom ... 15s. 0d. Abroad ... ... 20s. 0d.

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EDITORIAL COMMENT.

Aircraft in the Balkan War.

Although the reports which have reached the outer world from the seat of war in the Balkans have probably created a record in their attenuated and meagre character, and particularly though the references made to the use of aircraft by the belligerents have been few and far between, yet it is possible for the student of military aviation to gather much illuminating material from the reports of the correspondents. In order that we may not mislead ourselves, it must be said at once that the war has not afforded much information upon one essential point in connection with the bearing of aircraft in modern warfare. It has not, so far as is at present known, thrown any light upon what is likely to happen in the air when two armies are arrayed against each other, both equally strong in aerial craft. It is a question which is open to a great deal of speculation, and until the actual shock of war in the air comes to inform us it must remain a matter for surmise, outside of certain limits. From the soldier-student's point of view it is unfortunate that the Turkish air corps—of the existence of which we were assured before the outbreak of hostilities—has proved as effete and ineffective as the rest of their organisation.

Apart from this one aspect of failure, however, the first real test of the aeroplane in war must lead inevitably to the conclusion that the flying machine has fully justified itself as part of the equipment of the modern army in the field. The reports from the front are fragmentary in the extreme, but piecing them together and, above all, reading between the lines of such information as we have available, it is obvious that the Bulgarians at least have made considerable use of their aircraft, and with a great deal of success. Particularly around Adrianople the Bulgarian airmen appear to have done excellent work, and we read of flights extending along the whole Turkish front, in the course of which most valuable information was secured. How far the successful issue of the campaign has been affected by the increased power of reconnaissance conferred on the Bulgarian headquarters staff by the possession of a well-organised air-corps, it is impossible to say at present. In the light of what we already know, however, it is not unfair to assume that the aeroplane has fulfilled all that was expected of it.

A point which is to be noted, though it would be unsafe to assume too much from the issues of so one-sided a campaign as the one now apparently drawing to its end, is the comparatively small casualty list. Again, too, it must not be lost to sight that there is very little in the way of reliable information to go upon, but so far as we know at present the Turks appear to have killed one Bulgarian aviator and captured another. This, it must be admitted, is a surprisingly low percentage, having regard to the number of flights which we know have been made, and, if it represents the whole total, makes out the *rôle* of the air-scout to be far less dangerous than has been supposed. Once more, though, it must be pointed out that all the Bulgarian reconnaissance work has been carried out against an enemy powerless to deal an aerial counter-stroke, which must necessarily make an enormous difference when the casualty returns come to be reckoned.

Although, as we have said, the aeroplane may be adjudged to have justified itself as an adjunct of war, even in the light of the relatively small amount of information we have at present, there can be little doubt but that when the history of the Balkan war comes to be written, it will be found that all our present appreciation of what it has done must fall short by far of what is due on its real accomplishments.

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German Airships and British Fortresses.

Very widespread interest has been caused by the questions asked by Mr. Joynson-Hicks in the House of Commons relative to the supposed passage of the Zeppelin airship "L1" over Sheerness on October 14th

It will be remembered that in our issue of the 19th ult. we recorded a 30 hours' flight of this vessel, which is officially stated to have commenced on the 13th and ended at Johannisthal on the afternoon of the 14th October. If the German version of the dates on which this voyage took place is to be relied upon, then it is manifestly impossible that the mysterious craft which is said to have passed over Sheerness on the evening of the 14th could have been the Zeppelin. That is a mystery which can only be cleared up by the statements of those who formed the crew and passengers of "L1," and it is scarcely probable that any explanation will be forthcoming which would tend to confirm the view that a German airship did indeed pay a visit to the estuary of the Thames on the date in question, or on any other occasion, for that matter.

The main point to which attention should be drawn with some insistence, is the distinct probability, or at least possibility, of such visits from foreign aircraft. In the minds of many of the public there is a disposition to regard the whole thing as a pure fiction on account of its inherent improbability. Without committing ourselves to any definite opinion as to whether or not "L 1" has in fact flown over Sheerness, we say that there is not the slightest reason why she should not have done so. According to the German official statement, during the 30 hours' flight of this vessel, she covered over a thousand miles—a distance which would be almost exactly accounted for by a straight-away flight from Friederichshafen to Sheerness and across to Berlin, and, it may be said, a good deal more than the return trip across the North Sea from Emden. It is not only possible for such craft as the Zeppelin to cross the North Sea and get back in safety, but such flights as this may be said to fall quite within the ordinary compass of these vessels. To Great Britain as a nation the moral is so obvious as to need no emphasis.

It is one thing to be able to see a moral that is, metaphorically speaking, a very "sky-sign" for plainness, but it is often another matter to understand the ways and means of giving it effect. The one thing necessary, so far as we can see, is that more money should be forthcoming for aeronautics in the Estimates for next year, and to this end we can imagine nothing more useful than that the Chancellor of the Exchequer should become personally imbued with the importance of this matter from the national point of view. When France makes a display of aeroplanes, someone asks in the British Parliament what we have to equal it. When Germany is rumoured to have visited the Thames by dirigible, the question is again asked in the British Parliament whether we could do the like. This is the polite parliamentary way of calling attention to facts, and in the long run it will, it may be supposed, have the desired effect. As, however, England already has the nucleus of a first-class organisation in its Royal Flying Corps, Central Flying School, Royal Aircraft Factory and Advisory Committee, we really do think that the Government might well come to the conclusion that the time has arrived for genuine liberality. With the tension of international affairs what it is, the policy of letting the other fellow get there first is a shade too risky for our liking.

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Military Aviation in France.

From time to time we feel called upon to direct attention to the enormous strides which are being made in the creation of a real "fourth arm" in France, until the matter is becoming almost one of habit. The latest phase of military activity is in the seconding of still another large batch of officers and non-commissioned officers for service with the air-corps, numbering 99. What the exact number of qualified pilots at the disposal of the French war-staff may be we do not know at the moment, but we do know that this last detachment alone is far stronger than our own tiny force as represented by the Royal Flying Corps.

Another eloquent evidence of the intense seriousness with which the problem of aerial defence is regarded across the Channel is the recent publication of a list of more than 120 points at which there are good landing places, in most cases equipped with hangars, for military aeroplanes. Apparently the sites for these aeroplane stations, as they may be termed, have been selected by local associations under the direction of the A.G.Ae. which is a patriotic body formed and directed for the purpose of encouraging military aviation. We in this country, needless to say, have no association of the kind. Not that we have not enthusiasts enough to form the nucleus of such a body, but what is wanting is the necessary public interest and, truth to tell, we almost despair of the possibility of arousing that interest.

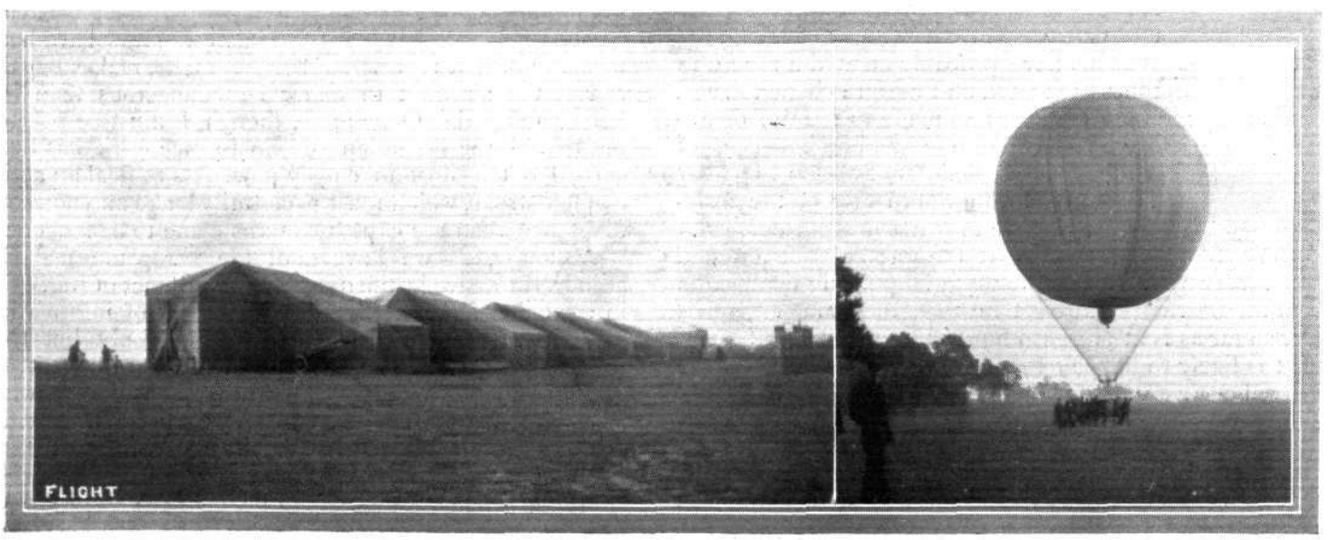
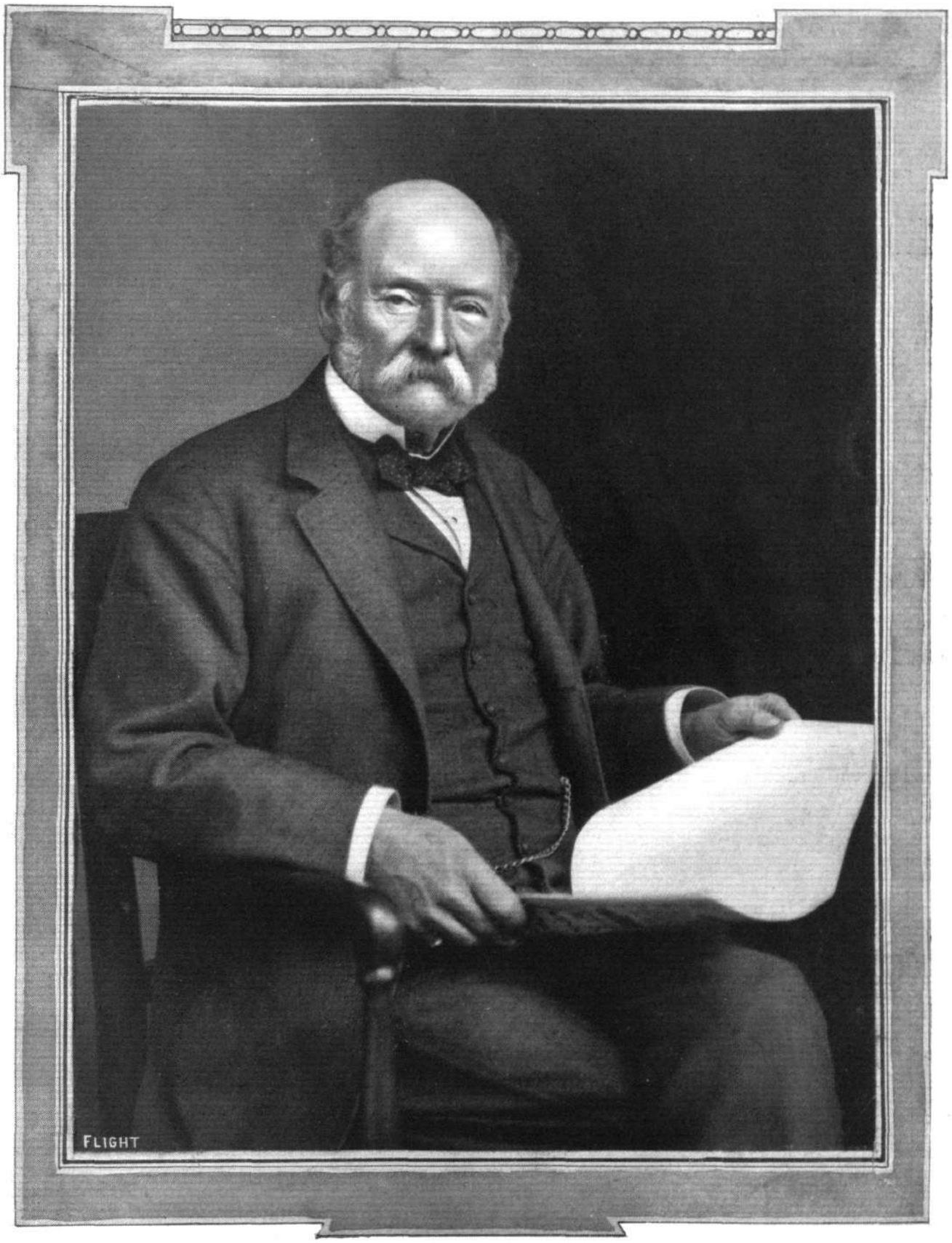


Photo by Mr. M. Pirkis.

The aeroplane tents on Farnborough Common in connection with the military machines, and, on the right, one of the Army balloons about to make a journey.

MEN OF MOMENT IN THE WORLD OF FLIGHT.



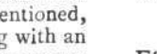
The Chairman of the Aerial League of the British Empire: Major-General H. T. ARBUTHNOT, C.B.

THE WEEK-END AT HENDON.

A BUSY afternoon was spent up at Hendon on Saturday last, for no fewer than fifteen flights were made, exclusive of a speed contest between two of the aviators. A notable point in connection with these exhibition flights was that they were all remarkably good, two in particular being worthy of special menti n, viz., an exceptionally steady flight by Mrs. Stocks on the 50-h.p. Gnome-Blériot monoplane—the same machine that Marcel Desoutter flew earlier in the afternoon—and M. D. Manton's first extensive exhibition flight. At three o'clock, Manton—who, by the way, is now second instructor at the Grahame-White School—brought out the Grahame-White 'bus, and after making quite a neat "get off" soon rose to about 2,000 ft., and steered out across country. When again inside the aerodrome he had to make a hurried landing, owing to one of the inlet valves of the engine breaking; he managed, however, to land quite safely. We may expect big things from this young pilot, who already feels quite at home in Lewis Turner's old place. The next up was Louis Noel on the 80-h.p. Henry Farman biplane, with a flight lasting about seven minutes. He had not been up a minute when Pierre Verrier ascended on the 70-h.p. Renault-Maurice Farman (British built) and executed some very fine banked turns. Next followed a sixteen-minute flight by Marcel Desoutter on the 50-h.p. Blériot. Several times he raised his hands above his head, much to the wonderment of his audience. In the meantime Verrier made two passenger flights on the Maurice Farman biplane, each lasting about four minutes. Sydney Pickles and Louis Noel then took the air, the former on the 35-h.p. Anzani-Caudron biplane, and the latter on the 80-h.p. Farman. Both flew about together for some time, handling their mounts in excellent style, Sydney Pickles coming down after 12 mins., and Noel following a few minutes after. Mrs. Stocks then took charge of the 50-h.p. Blériot, and, as we previously mentioned, gave a splendid exhibition flight, flying high, and finishing with an excellent landing. Just before 4 o'clock Noel took up a passenger on the 80-h.p. Farman, and kept going for several circuits for about 8 mins. Three machines next went up, following one another at intervals of a minute; these were the Blackburn monoplane, piloted by H. Blackburn, the Maurice Farman biplane, with Verrier at the helm and carrying a passenger, and the 60-h.p. Anzani-Caudron biplane with Sydney Pickles up. All three remained aloft together for several minutes, and Sydney Pickles finished up with a splendid spiral *vol plané*.

A friendly speed handicap was then arranged between Marcel Desoutter and Louis Noel; the latter was to fly the 80-h.p. Farman and get 15 secs. start from Desoutter on the Blériot. Noel got away very quickly, and took the biplane over the course of four laps in a superb manner, passing the pylons with apparently only a few inches to spare. It was a close race, however, for Desoutter gradually caught him up, and was only about 25 yards, or to be exact 4 secs., behind Noel at the finish. Two passenger flights, one by Verrier on the Maurice Farman, and the other by Sydney Pickles on the 60-h.p. Caudron, wound up the proceedings of the day at 4.30 p.m., it being almost dark.

An important event occurred on Sunday morning, when Maurice Farman came up to the aerodrome and made several flights on one of the British-built (Aircraft Co.) biplanes bearing his own name, at one time taking Mrs. Holt Thomas for a short trip. He expressed himself highly satisfied with the results of his trial flights and with the workmanship of the biplane, and, after a short talk, left the aerodrome for Paris, by way of land and water. As he left the aerodrome, Verrier, on the biplane, flew over his car as it made its way down Collindale Avenue. In the afternoon the postponed (from the 10th inst.) "Motor Sunday" was held, many well-known motorists being present, and quite a number of exhibition and passenger flights were made. At 3.20, Gustav Hamel, after a preliminary spin round the aerodrome, left for Brooklands, where he arrived in 19 mins., and it was not until it was almost dark that he returned to Hendon with a sensational dive into the aerodrome. Other flights were made by the following pilots:—Marcel Desoutter, on the 70-h.p. Handley-Page monoplane, and later several flights on the Blériot; Mrs. Stocks, also on the 50-h.p. Blériot; P. Verrier, on the Maurice Farman, and Louis Noel, on the Henry Farman, made numerous passenger flights; and Sydney Pickles was also out on the Caudron biplane.



Flying at Sheffield.

MR. J. L. HALL, who for some time has been doing some remarkable work on the Blériot monoplane at Hendon, has now taken his machine to his native city, Sheffield, and on Saturday afternoon he made several ascents from the Redmires Racecourse. The weather was very misty, but in spite of this handicap he gave a very fine exhibition, and during one flight got up to a height of about 2,000 ft. Arrangements have been made with Mr. Hall for exhibition flights each afternoon during this week, and also to carry a special aviation edition of the *Sheffield Telegraph* to Doncaster and other places.

"Flight" Copyright.

Mr. Maurice Farman, accompanied by Mrs. Holt Thomas as passenger, about to start for a flight at Hendon Aerodrome on Sunday last in the British-built Maurice Farman machine.

A snap of Raynham flying on the Burgess-Wright in connection with one of the contests—the Shell—at Hendon Aerodrome during the past season.

FACTOR OF SAFETY AND NORMAL SPEED.

By W. O. MANNING, A.F.Aë.S.

THE articles recently appearing in FLIGHT on the subject of the factor of safety in aeroplane design were certainly well timed, and doubtless others beside myself have been led to think more closely on this matter now that we are asked to commit ourselves to the support of some numerical value. For my own part, I have been looking into the matter and have found, as is invariably the case, that even a brief study reveals aspects not hitherto appreciated. Thus, I now raise the query whether the factor of safety should not vary inversely as the normal speed of the machine, if aeroplanes of different kinds are to be equally strong under the same weather conditions.

The argument that I am about to put forward makes no pretence at accuracy in detail, nor does it pretend to take into account all of the many considerations that are properly related to a complete study of the subject. On the other hand, I think it can claim some measure of interest as a line of thought, and as such I present it for discussion to other readers of FLIGHT. As an hypothesis I assume that the basis on which the factor of safety should be established may be represented by assuming that the abnormal stress in flight results from the machine being struck by a gust equal to (n) times its normal velocity, and that the additional expected stress is in the ratio of $V^2:(V+nV)^2$. Resolving this expression to its simplest term, as follows: $\frac{(V+nV)^2}{V^2} = \frac{V^2+2nV^2+n^2V^2}{V^2} = n^2+2n+1$, we find that the factor of safety becomes a function of $(n+1)^2$, which may be written thus: $k\left(\frac{v}{V}+1\right)^2$ where v = gust and V = normal speed, both in m.p.h., and k is a constant.

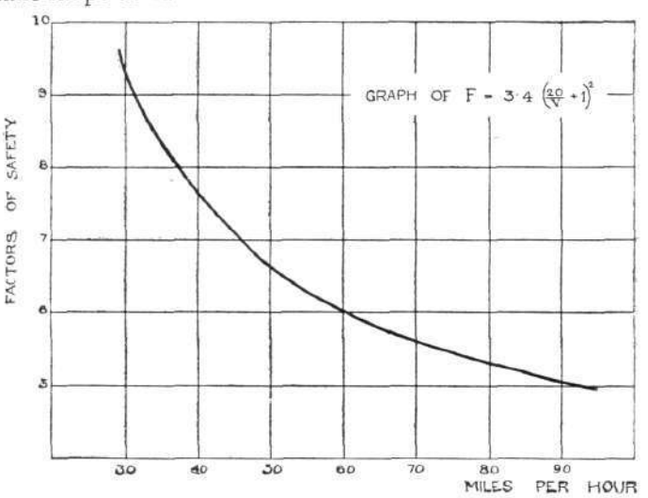
Now it is necessary to adopt some arbitrary standard as a basis that is acceptable to all, and for the sake of argument I will suppose that the standard is a factor of safety of 6 at 60 miles an hour. The next point to consider is the probable maximum value of n, and at first sight one is inclined to adopt as a basis the idea of a maximum gust being a percentage of the normal flight speed. This, however, would essentially differentiate between the weatherliness of slow and fast machines in a manner that would not only be unjust to the slower craft, but would put an arbitrary premium on high speed in a way that is hardly proper.

Moreover, the weather is not under control, and if you glance for a moment at the wind charts published on pp. 792–3 of FLIGHT for August 31st, 1912, you will see that a more reasonable assumption is to adopt some arbitrary numerical value for the gust that may strike any machine, whether its normal speed is high or low. Again, for the sake of argument, I will take the numerical value of 20 as a reasonable gust value and transposing it in the formula I find that a constant $k = 3{\cdot}4$ is necessary in order to provide a factor of safety of 6 at 60 m.p.h. The formula therefore becoming $3{\cdot}4\left(\frac{20}{V}+1\right)^2$.

Now the machine that is built with a normal speed of 30 m.p.h. will ordinarily have its parts calculated on a basis of 30^2 whereas a 60 m.p.h. machine will ordinarily be designed with the figure 60^2 in view (I am ignoring for the moment the question of gusts and am merely assuming that the design is based on the flight speed itself). Thus if the 30 m.p.h. machine so designed is struck by a 20 m.p.h. gust it will be relatively weaker than the 60 m.p.h. machine under the same circumstances, because a 20 m.p.h. gust only represents a 30 per cent. increase on the speed for which the size of the parts have already been calculated, whereas with the 30 m.p.h. machine the percentage increase is twice as much.

The question arises, therefore, what factor of safety should the 30 m.p.h. machine possess at 30 m.p.h. if it is to have the same effective margin of strength as a 60 m.p.h. machine, when both are struck by a 20 m.p.h. gust? I have prepared a curve from the formula, which shows this relationship graphically, and if the basis is that the 60 m.p.h. machine is to have a factor of safety of 6 at its normal flight speed, then to be equally strong in the presence of a 20 m.p.h. gust, the 30 m.p.h. machine must be designed for a factor of safety of 9·4 in respect to its normal speed.

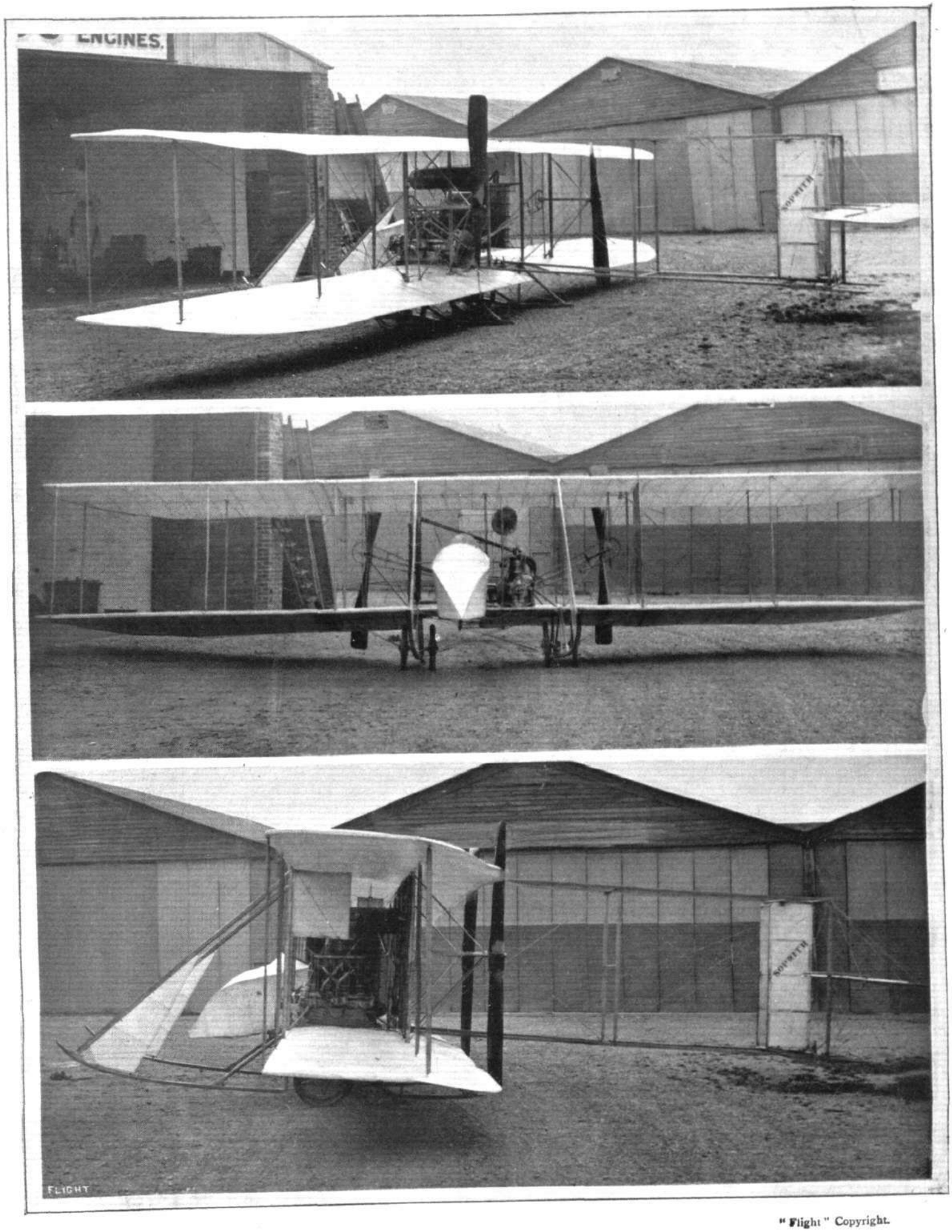
As I said in the first instance, this is more a line of thought to be discussed than a definite suggestion for a basis of present design, but it is conceivable that it might take shape as such in future if the criticism of others fails



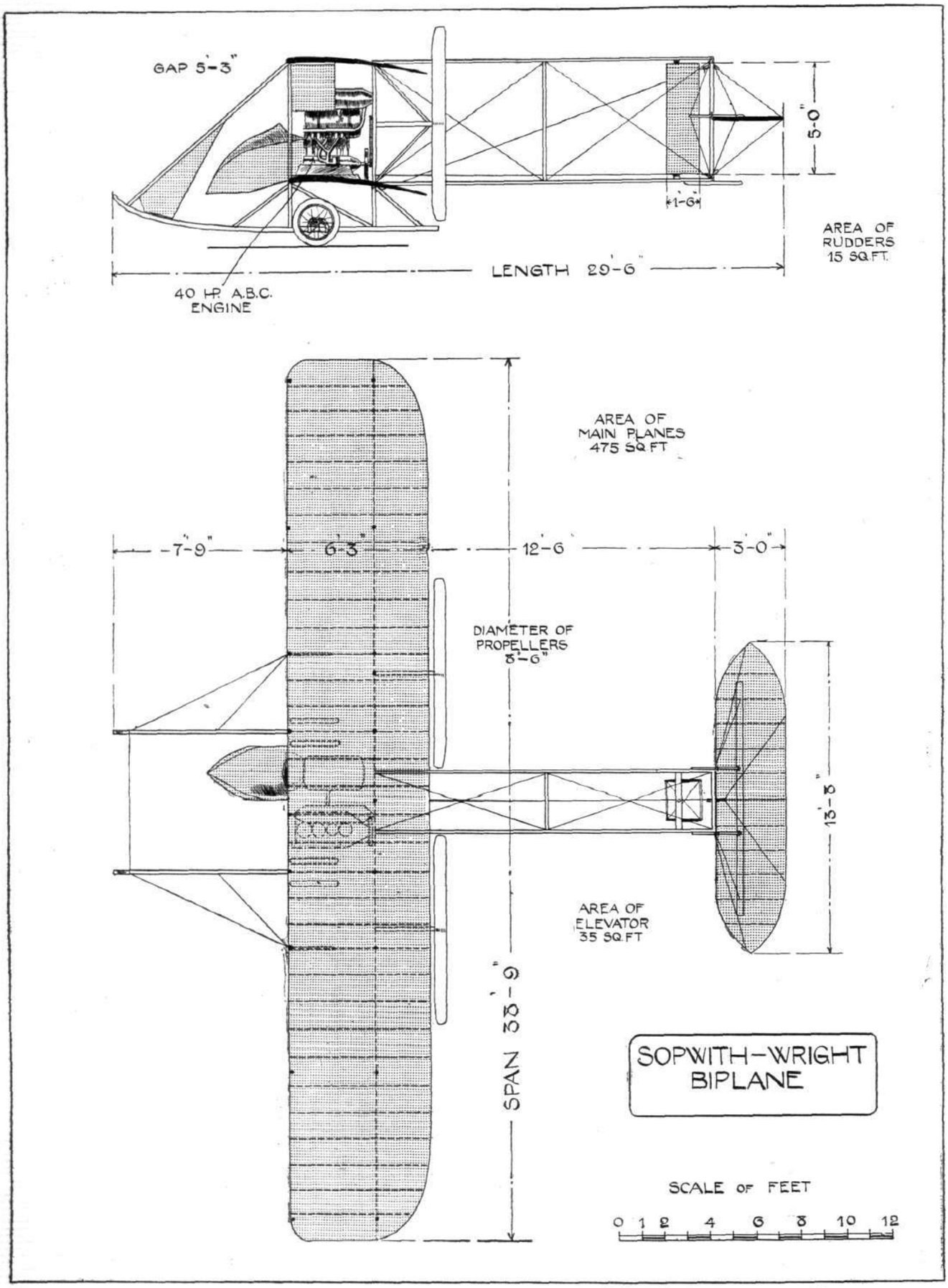
to disclose any radical error in the argument. The subject of the factor of safety is certainly one of vital consequence to designers, and the idea put forward in FLIGHT that we should endeavour to establish some basis for mutual moral support is at least sufficient reason why the technology of the subject should receive the serious attention of those interested; I hope, therefore, that others will take the matter up.

When I was on the Plain, Mr. de Havilland told me that he had carried out experiments with BE 2, with a view to discovering the maximum increased strain that could be produced in the wires by taking the machine out in a very bad wind, and controlling her in a way likely to produce maximum stress, the wires to be tested having been fitted with an instrument for determining these strains. I understand that the maximum strain observed was twice the normal.

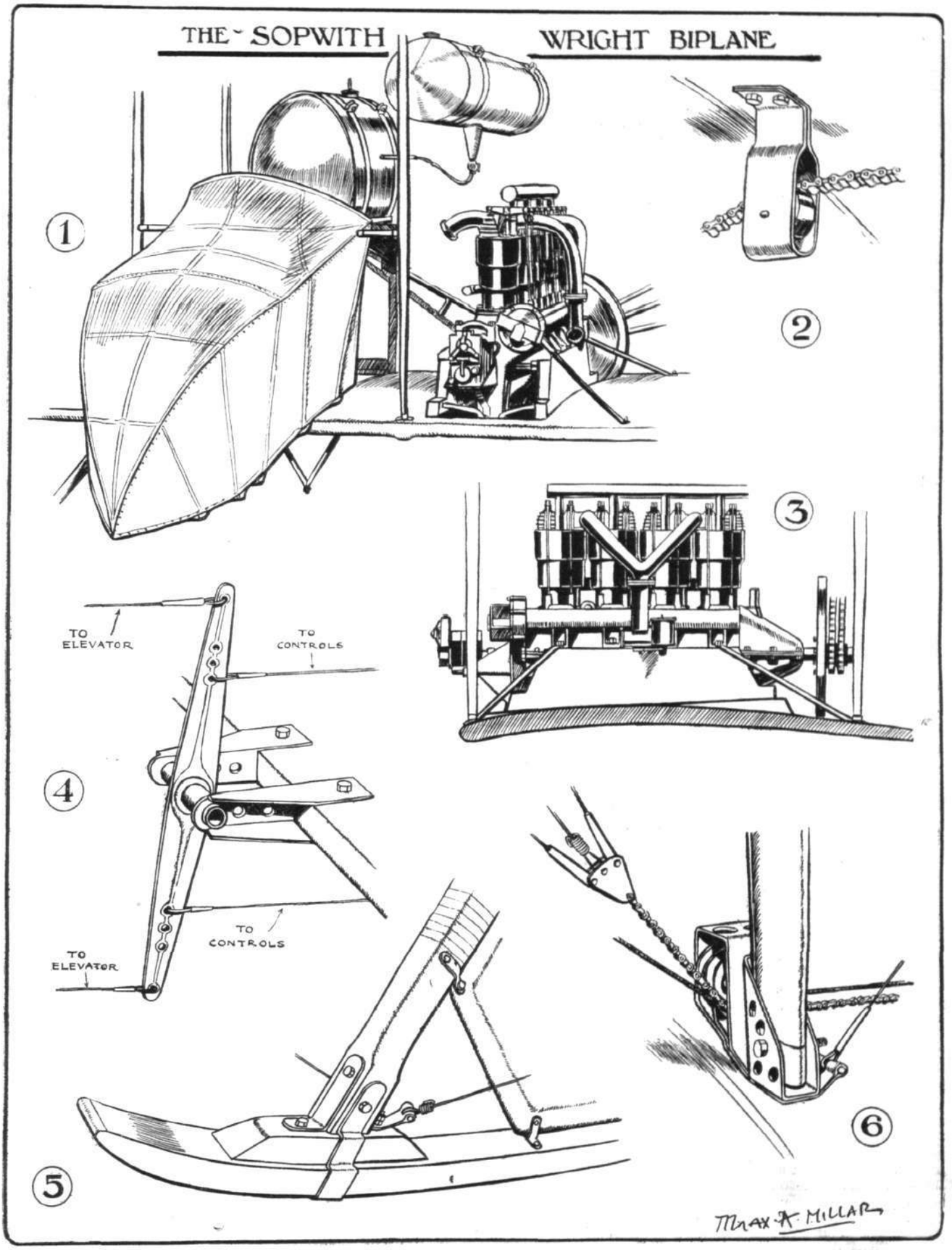
Under these conditions $\left(\frac{v}{V}+1\right)^2 = 2$; $\frac{v}{V}+1 = 1{\cdot}41$; $\frac{v}{V} = {\cdot}41$. But we know the maximum speed of BE 2 to be about 70 m.p.h.; hence the stress was that equivalent to a head gust of 28·7 m.p.h. This points rather to the advisability of v being taken as 30 m.p.h. in the case of military machines and others which might be taken out in very bad weather. BE 2's factor of safety should be, therefore, $3{\cdot}4\left(\frac{30}{70}+1\right)^2 = 7$, which, I believe, is substantially correct.



The Sopwith-Wright biplane.



Elevation and plan of the Sopwith-Wright biplane.



THE SOPWITH-WRIGHT BIPLANE.—Sketches illustrating various constructional details: 1. The nacelle, which protects the pilot from the wind. 2. Portion of the short length of chain which is used as a link in the warp wires where they pass over the pulleys. 3. Method of mounting the engine on the lower plane. 4. Pivoted lever for gearing up the elevator to the control lever. 5. The toe portion of one of the skids. 6. Another sketch showing how the warp wires are carried round their pulleys.

THE SOPWITH-WRIGHT BIPLANE.

THAT excellent performance of Hawker recently with the Sopwith-Wright biplane in his flight for the British Michelin No. 1 draws attention both to a man and a machine comparatively little known. We say little known, because the pilot at any rate is a newcomer among the men whose names have been prominent in the front rank, and although the machine bears the most famous name in the world of flight, nevertheless, the Wright design is by no means so familiar to English students of aeroplane construction as ought to be the case, having regard to the pre-eminence of its originator.

This particular example of the Wright design, as modified by Sopwith, himself among the foremost British pilots, possesses the peculiarity of having a Farman instead of a Wright control, and for this reason alone an especial interest attaches to it and demands that it should find an early place in our gallery of machines even were the present occasion less opportune than it is.

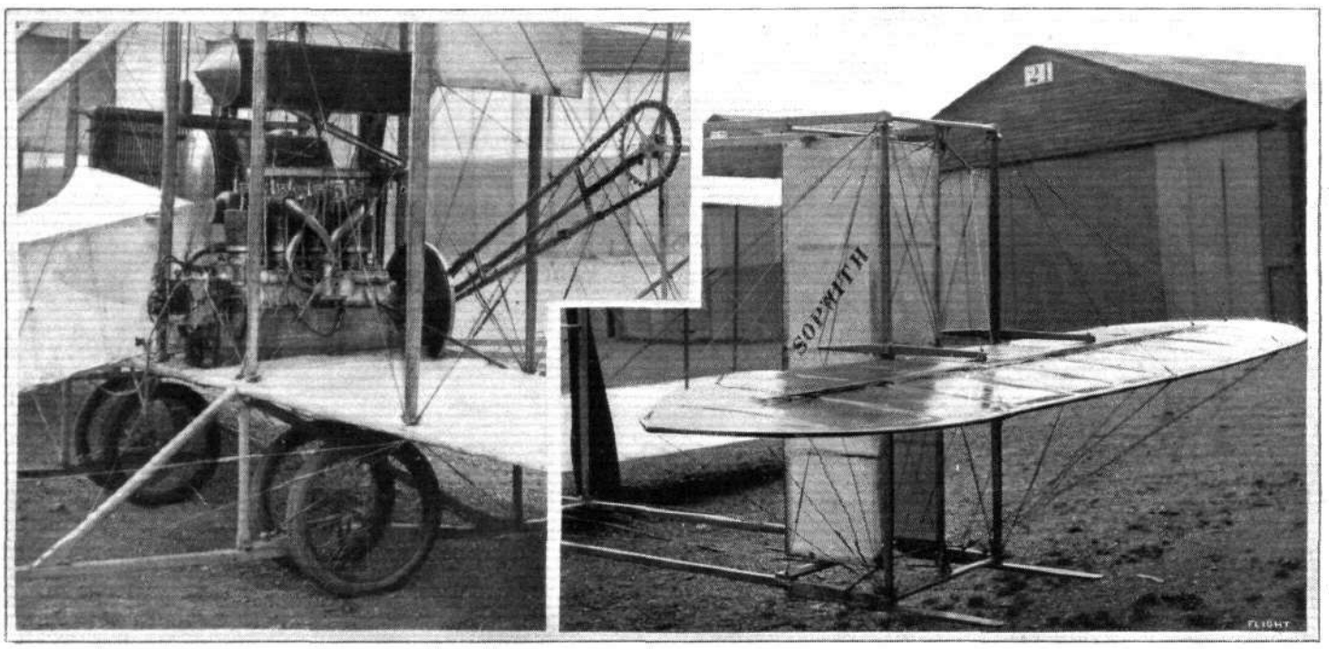
It was during last year that Sopwith had the original of this machine made for him in America by Burgess, the well-known boat builders, who are constructing Wright biplanes under licence. He had the Farman lever and rudder bar control, with which he was already familiar, fitted to the machine instead of the Wright interconnected warp and rudder control with which the Wright machines are ordinarily supplied, and he also was the first we believe to place a Gnome rotary engine on this type of aeroplane. As now flying, however, the Gnome rotary is replaced by the splendidly successful British-built A B C engine, which drives the twin propellers made by the Bristol Co. through the usual pair of chains, one of which is crossed.

In the present machine, there is nothing, we believe, of the original aeroplane as purchased by Sopwith, the whole of it having been reconstructed in his own factory. It has, as our illustrations show very clearly, a small nacelle, somewhat resembling in appearance the familiar sidecar with which so many motor bicycles are nowadays provided. Behind this little shield the pilot is protected from the wind, which is especially a point of importance in the Wright machine seeing that ordinarily every inch of the pilot's body is exposed, and flying any machine in winter weather is a bitterly cold job at the best.

With the exception of the features that have just been mentioned, the reconstructed machine serves as an example of standard Wright practice ; it has the same type of main planes with their front spars forming the leading edges and their struts mounted on flexible joints, which from the first has been a characteristic feature of the Wright design.

Diagonal wires turn the whole structure into a box girder, but the arrangement of wires between the rear spars differs from that in front, because the extremities of the rear spar are flexed in the process of wing warping.

The tail, which is carried on a light box girder outrigger, consists of a twin rudder mounted on a common pivot and the fixed horizontal plane with a flexing trailing edge that serves as an elevator. With the Farman system of control on this machine, elevating is performed by moving the control lever forward, while wing warping results from moving it sideways. The rudder is operated independently by foot. In the standard Wright control, the rudder is operated by a movement of the handle of the warping lever, which is hinged to the lever itself so that the rudder can be operated independently from, or simultaneously with the warp. The elevator in the Wright system is under independent lever control.



"Flight" Copyright.

Views showing the British-built A B C engine and the tail of the Sopwith-Wright biplane.—The twin rudder is mounted on a single pivot at each end, the horizontal tail plane is fixed, and has a flexible trailing edge for use as an elevator.

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Good Work on the New Bristol.

ON Thursday last week Mr. Gordon England, at Filton, went out for the first time on one of the new Bristol tractor biplanes in which pilot and passenger sit in tandem. He made a really fine flight, remaining up for about half an hour and landing well. The machine answers the controls perfectly and shows a fine speed. On Friday, England ascended at 1.45 p.m., and flew for quite half an hour, the outstanding feature of his trip being the beautiful *vol plané* in landing.

Whilst quite two miles away from the ground from which he started, his engine failed, and, from a height of about 1,200 ft., England effected a remarkably fine landing, thus giving evidence of the gliding angle of the biplane. Later in the afternoon he was again out, this time reaching fully 2,500 ft., and flying for well over half an hour.

Saturday morning again saw the aviator in the air, his flight lasting for about three-quarters of an hour, during which he flew three very wide circuits and reached an altitude of 3,500 ft.

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Humours of Aviation.

A CERTAIN American aviator's wife was taking her first trip with her husband in his airship. "Wait a minute, George," she said, "I'm afraid we will have to go down again." "What's wrong?" asked her husband. "I believe I have dropped one of the pearl buttons off my jacket, I think I can see it glistening on the ground." "Keep your seat, my dear," said the aviator, "that's Lake Erie."—*Evening Standard.*

The Royal Aero Club of the United Kingdom

OFFICIAL NOTICES TO MEMBERS

Annual Dinner.

THE Annual Dinner of the Club will take place in the month of February, 1913. The exact date and place will be announced later.

British Empire Michelin Competitions.

The attention of Members is called to the Rules governing No. 2 Competition for the year 1913. The Prize is now increased to £800, this being the last year in which it will be offered. Competitors are reminded that the Prize can now be competed for.

BRITISH EMPIRE MICHELIN CUP NO. 2, £800.

(*Under the Competition Rules of the Royal Aero Club.*)

The Michelin Tyre Company has presented to the Royal Aero Club of the United Kingdom for competition by British aviators, the sum of £800, to which will be added a trophy to be retained by the winner.

The following are the rules governing the competition for the year 1913 :—

1. The winner for the year 1913 shall be the competitor who, on October 15th, 1913, shall have completed a prescribed circuit of about 279 miles on an aeroplane in flight in the fastest time, reckoned in miles per hour.

2. Competitors may select their own circuit of about 279 miles, but the start must be made from a flying ground approved by the Royal Aero Club, and the proposed circuit must be submitted to the Royal Aero Club before the flight is made.

The complete circuit must be accomplished without alighting.

3. The flight must be observed at each point named in the circuit by officials appointed by the Royal Aero Club.

4. A number must be prominently displayed on the aeroplane in places approved by the officials, and when flying round each of the points selected in the circuit, the aviator must fly sufficiently low so that his number may be easily verified by the official observer.

5. The circuit must be completed between the hours of sunrise and sunset, on any one day.

6. The entrant, who must be the person operating the machine, must be a British subject, flying on a British-made aeroplane, must hold an Aviator's Certificate, and must be duly entered on the Competitor's Register of the Royal Aero Club.

7. The complete machine, and all its parts, must have been entirely constructed within the confines of the British Empire, but this provision shall not be held to apply to raw material.

8. An entrance fee of £1 must accompany every notification of an attempt, and at least three clear days' notice must be given to the Secretary, Royal Aero Club, 166, Piccadilly, London, W. A competitor must further deposit a sum of £10 on account of expenses, if any, of observers. Any balance not so expended will be returned to the competitor.

9. Should any questions arise at any time after the date of entry as to whether a competitor has properly fulfilled the above conditions, or should any other question arise in relation to them, the decision of the Royal Aero Club shall be final and without appeal.

10. A competitor by entering waives any right of action against the Royal Aero Club or the Michelin Tyre Co. for any damages sustained by him in consequence of any act or omission on the part of the officials of the Royal Aero Club or the Michelin Tyre Co., or their representatives or servants, or any fellow competitor.

11. The aeroplane shall at all times be at the risk in all respects of the competitor, who shall be deemed by entry to agree to waive all claim for injury either to himself or his aeroplane, or his employees or workmen, and to assume all liability for damage to third parties or their property, and to indemnify the Royal Aero Club and the Michelin Tyre Co. in respect thereof.

12. The Royal Aero Club reserves itself the right to add to, amend, or omit any of these rules should it think fit.

BRITISH EMPIRE MICHELIN COMPETITION NO. 1, £500.

(*Under the Competition Rules of the Royal Aero Club.*)

The Michelin Tyre Company offered this Prize annually for a period of five years, and the Competition for 1913 will be the last year. The Competition for 1912 was for duration, and the Committee of the Royal Aero Club will shortly consider the conditions for the ensuing year. The Committee will be glad to receive suggestions for the Competition.

International Aero Show at Olympia.

The International Aero Show held by the Society of Motor Manufacturers and Traders, under the auspices of the Royal Aero Club, will open on February 14th, 1913, and terminate on February 22nd.

Full particulars can be obtained on application to the Exhibition Manager, Society of Motor Manufacturers and Traders, Maxwell House, Arundel Street, Strand, London, W.C., or the Secretary, Royal Aero Club, 166, Piccadilly, London, W.

Members of the Royal Aero Club will be admitted free on production of their membership cards.

In connection with this Exhibition, a section for models will be organised by the Royal Aero Club, assisted by the Kite and Model Aeroplane Association. The Royal Aero Club will offer prizes amounting to £50 in this section. Full particulars can be obtained from the Secretary of the Royal Aero Club.

Models may be exhibited in the following classes :—

1. *Power-driven Models* (excluding rubber and spring motors).—Minimum duration of flight, 30 secs. 1st Prize, £12 ; 2nd Prize, £5.

2. *Models driven by any other motive power.*—

(*a*) Rising from the ground. Minimum weight, 8 oz. Minimum duration of flight, 30 secs. 1st Prize, £5 ; 2nd Prize, £2 ; 3rd Prize, £1.

(*b*) Launching by hand. Minimum weight, 4 oz. Minimum duration of flight, 30 secs. 1st Prize, £2 ; 2nd Prize, £1.

3. *Hydro-Aeroplane Models.*—Minimum weight, 8 oz. Minimum duration of flight, 15 secs. 1st Prize, £5 ; 2nd Prize, £2.

A tank will be provided in which the Models will float during the exhibition.

4. *Scale Models or Part Models*, embodying new design applicable to full-sized machines. A Prize of £10 will be awarded in this class at the discretion of the judges.

5. *Model Aero Motor* (excluding rubber and spring motors).—Prize, £5. The Model will be judged on a weight per horse-power basis, the ratio not to exceed 8 lbs. per horse-power. The weight is to include all accessories with fuel for a minimum run of two minutes, to be taken on a bench test, and the total weight is not to exceed 16 lbs.

The Judges in awarding the Prizes will take into consideration design, construction, duration of flight, and stability. The maximum marks to be awarded is 150, divided as follows :—Design and Construction, 50 marks ; Duration of Flight, 50 marks ; Stability, 50 marks.

The Royal Aero Club will erect suitable stands and provide the necessary attendants. No charge will be made to exhibitors for space, but an entry fee of 5*s.* per model will be payable. A reduced charge will be made in the case of collective exhibits from Model Aero Clubs.

Arrangements will be made for a practical demonstration of the Models entered in Classes 1, 2, 3, and 5, to take place shortly after the close of the Exhibition. The date and place will be announced in due course.

166, Piccadilly. HAROLD E. PERRIN, Secretary.

ROYAL FLYING CORPS.

THE following appointment was announced in the *London Gazette* of the 15th inst. :—

Establishments. Royal Flying Corps. Central Flying School.—Capt. John M. Salmond, the King's Own (Royal Lancaster Regiment), to be an inspector (graded flight commander), *vice* Capt. P. W. L. Broke-Smith, Royal Engineers. Dated November 12th, 1912.

The following appointments were announced by the Admiralty on the 19th inst. :—

Lieuts. W. Parke and J. W. Seddon to the "Actæon," additional, as flying officers, to date Sept. 2nd and Nov. 2nd respectively.

The following was announced on the 19th inst. :—

Lieut. J. C. Porte (retired), to the "President," additional, for Aviation Course, undated.

AEROMOTORS EXHIBITED AT THE PARIS AERO SALON.

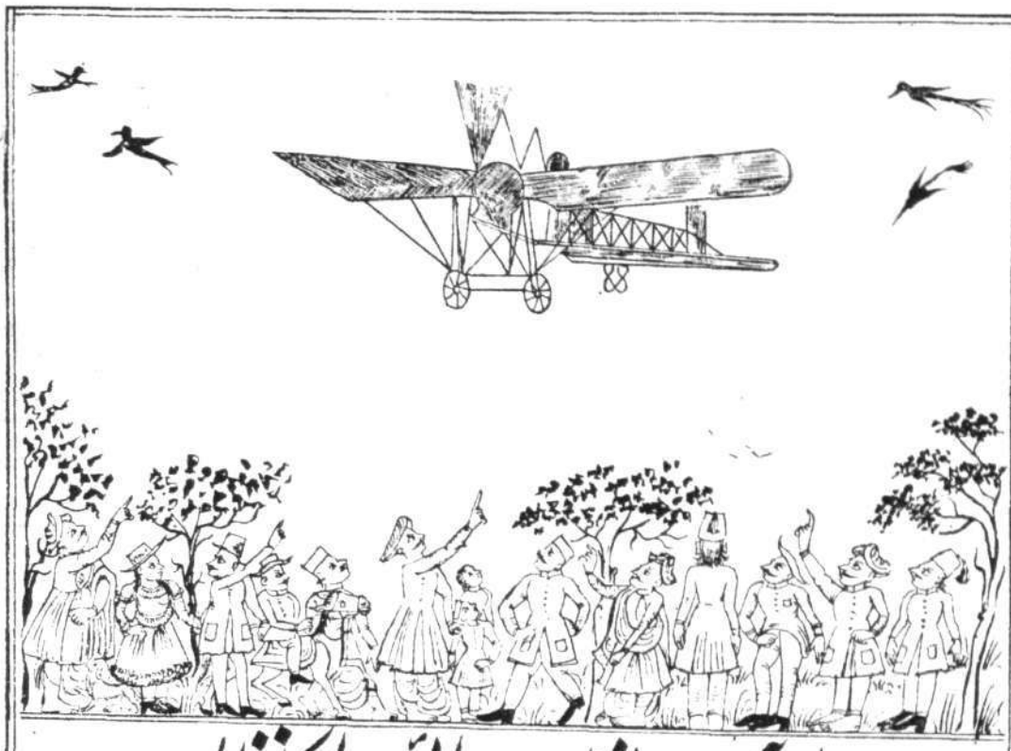
Tabulated particulars compiled, with the assistance of *L'Aero*, from data supplied by the manufacturers.

Name of Motor.	H.P.	Type. *	Type. Arrangement of Cylinders.	No. of Cylinders.	Bore. mm.	Stroke. mm.	Speed.	Inlet Valves.†	Cooling.	Carburettor.	Weight in lbs. Total.	Weight in lbs. Per h.p.	Consumption per hour in gallons. Petrol.	Consumption per hour in gallons. Oil.	Price in £.	
Anzani	30	S	Fan	3	105	130	1250	M	Air	Zenith	154	5·1	2·25	·6	120	4-stroke
	30	S	Radial	3	105	120	1300	M	,,	,,	121	4·03	2·25	·6	120	,,
	45	S	,,	6	90	120	1300	M	,,	,,	154	3·4	3·25	·8	180	,,
	60	S	,,	6	105	120	1300	M	,,	,,	176	2·9	4·325	1·	240	,,
	80	S	,,	10	90	130	1250	M	,,	,,	224	2·8	5·75	1·3	320	,,
	100	S	,,	10	105	140	1200	M	,,	,,	297	2·97	—	—	400	,,
Bertin	50	S	X	4	116	150	1100	A	Air	—	132	2·64	—	—	—	,,
	100	S	X	8	116	150	1100	A	,,	—	209	2·09	—	—	560	,,
Burlat	35	R	X	8	95	120	956	A	Air	Burlat	187	5·3	3·35	1·	260	,,
	35	R	Radial	8	95	120	956	A	,,	,,	187	5·3	3·35	1·	260	,,
	60	R	X	8	120	120	940	A	,,	,,	264	4·4	5·35	1·	440	,,
	60	R	Radial	8	120	120	940	A	,,	,,	264	4·4	5·35	1·	440	,,
	75	R	X	8	120	170	940	A	,,	,,	308	4·1	7·	1·2	640	,,
	120	R	Radial	16	120	120	900	A	,,	,,	495	4·1	11·	1·75	880	,,
Clerget	50–60	R	Radial	7	120	120	1200	M	Air	Clerget	198	3·6	4·75	·9	520	,,
	50	S	Vertical	4	110	120	1500	M	Water	,,	165	3·3	3·3	·6	400	,,
	100	S	,,	4	140	160	1250	M	,,	,,	341	3·41	6·2	1·2	760	,,
	200	S	V	8	140	160	1250	M	,,	,,	495	2·5	10·	1·6	1280	,,
D'Henain	10–12	R	Radial	7	60	70	1100	M	Air	Solex	88	8·	—	—	—	,,
De Dion	80	S	V	8	100	120	1700	M	Fan	De Dion	484	6·	7·	·44	480	,,
	150	S	V	8	125	150	1600	M	Water	,,	968	6·4	10·5	·7	—	,,
Esselbé	60	R	O	1	65	204	1200	—	Air	Vapor	209	3·5	3·8	·33	440	,,
Favata	45	S	Vertical	4	110	120	1200	M	Air	—	110	2·4	4·	·24	520	,,
	85–90	S	Vert. or V	8	110	120	1200	M	,,	—	165	1·9	9·	·55	880	,,
	180	S	X	16	110	120	1200	M	,,	—	352	1·9	18·	1·1	1200	,,
Gnome	50	R	Radial	7	110	120	1200	A	Air	Gnome	167	3·3	3·3	·16	520	,,
	70	R	,,	7	130	120	1200	A	,,	,,	182	2·6	3·74	·88	640	,,
	80	R	,,	7	124	140	1200	A	,,	,,	191	2·4	4·	1·1	700	,,
	100	R	,,	14	110	120	1200	A	,,	,,	220	2·2	5·5	1·32	960	,,
	140	R	,,	14	130	120	1200	A	,,	,,	286	2·	6·6	1·76	1200	,,
	160	R	,,	14	124	140	1200	A	,,	,,	308	1·9	7·7	2·2	1400	,,
Laviator	50	R	Radial	6	100	130	1200	—	Air	Claudel or Zenith	198	3·9	6·3	·22	400	2-stroke
	65	S	,,	6	100	130	1200	—	,,	Claudel or Zenith	198	3·	6·3	·22	400	,,
	80	S	,,	6	100	130	1300	—	Water	,,	242	3·	11·2	·22	440	,,
	120	S	Vertical	4	145	175	1200	M	,,	,,	484	4·	8·6	·44	600	4-stroke
	110	S	,,	6	130	160	1100	M	,,	,,	616	5·6	—	—	840	,,
	250	S	,,	6	180	200	1050	M	,,	,,	1210	4·8	20·	·8	1440	,,
	80	S	V	8	100	130	1200	M	,,	,,	275	3·4	5·7	·3	520	,,
	120	S	V	8	114	160	1200	M	,,	,,	418	3·5	8·6	·44	760	,,
	200	S	V	8	147	175	1100	M	,,	,,	715	3·5	14·8	·66	1280	,,
Messpa	70	S	Horizontal	2	100	120	1600	—	Air	Messpa	176	2·5	5·5	·22	480	2-stroke
Panhard-Levassor	100	S	V	8	110	140	1500	M	Water	Panhard	440	4·4	—	—	600	4-stroke
	50	S	Vertical	4	145	160	900	M	,,	Krebs	660	13·2	—	—	240	,,
Renault	25	S	V	4	90	120	1800	M	Fan	Renault	242	9·7	—	—	220	,,
	40	S	V	8	75	120	1800	M	,,	,,	242	6·	3·8	·11	340	,,
	50–60	S	V	8	90	120	1800	M	,,	,,	374	7·5	—	—	420	,,
	70	S	V	8	96	120	1800	M	,,	,,	396	5·6	7·7	·22	480	,,
	100	S	V	12	96	120	1800	M	,,	,,	638	6·4	11·	·66	680	,,
R.E.P.	40–50	S	Fan	5	100	140	1100	M	Air	R.E.P.	242	5·3	3·3	·5	480	,,
	60	S	,,	5	110	160	1100	M	,,	,,	330	5·5	4·4	·65	560	,,
	95	S	Radial	7	110	160	1100	M	,,	,,	462	4·8	6·6	1·	640	,,
Rhone	50	R	Radial	7	105	140	1200	M	Air	Tampier	176	3·5	4·8	·55	520	,,
	80	R	,,	9	105	140	1200	M	,,	,,	242	3·	6·15	·77	640	,,
	100	R	,,	14	105	140	1200	M	,,	,,	308	3·08	—	—	960	,,
	160	R	,,	18	105	140	1200	M	,,	,,	374	2·3	13·3	1·3	1200	,,
Rossel-Peugeot	30–40	R	,,	7	109	110	1100	M	Air	Tampier	165	4·7	4·8	1·23	500	,,
	40–50	R	,,	7	110	110	1100	M	,,	,,	172	3·8	5·	1·23	520	,,
	50–55	R	,,	7	110	110	1150	M	,,	,,	165	3·3	5·5	1·23	560	,,
	100	S	Vertical	4	140	140	1300	M	Water	G.A.	352	3·5	7·25	2·5	500	,,
Salmson	60	S	Parallel	7	65	130	1000	M	Water	Zenith	198	3·3	4·3	·24	400	,,
	80	S	Radial	7	120	140	1250	M	,,	,,	286	3·6	7·15	2·1	600	,,
	110	S	,,	9	120	140	1250	M	Water	Zenith	352	3·2	10·6	2·9	720	,,
	300	S	,,	9	150	210	1200	M	,,	,,	990	3·3	24·5	4·	1900	,,
Siva	45	R	,,	8	83	96	800	M	Air	Aris	165	3·7	3·3	1·54	—	,,
Verdet	55	R	,,	7	112	140	1100	M	Air	Verdet	176	3·2	4·	·22	480	,,

* Rotary = R; Stationary = S.

† Mechanical = M; Automatic = A.

The above table speaks for itself not only as to the information that it gives about the engines there mentioned, but as a graphic illustration of the progress that has been made in the French aviation industry. The sixty-four models are produced by nineteen different manufacturers, but even this long list does not comprise the full number of engines that France can muster. The mere compilation of a list of this length in the present state of the industry must surely stand to the everlasting credit of France as a country that carries the principle of encouragement to the limit of its practical application. French enthusiasm does not stop at mere words, by one channel and another, but always from the same source, namely, the pockets of the people, money flows into the aviation industry. There are two main channels, one *via* the Government and the other *via* private enterprise, and their co-existence creates a mutual stimulus that reacts upon both. We see the same reaction in this country, where the trickle from the exchequer has scarcely moistened the parched soil in which the British tree of pioneer industry is doing its best to flourish.



چار آنے مین ہوائی جہاز کا نظارہ

اخبار ڈیلی پوسٹ کے اہتمام و انتظام سے

دنیا کے مشہور و معروف ہوائی جہاز پر اڑنیوالے مسٹر ہیران ڈی کیٹیرس اور مسٹر مارنسیو رٹیک کنٹونمنٹ بنگلور کے وسیع پریڈ میدان مین ۲ فروری ۱۹۱۱ء جمعرات کے روز ٹھیک ½ ۴ بجے ہوائی جہاز پر نکلینگے۔ معزز ناظرین کو اسبات سے اشتہار دیا جاتا ہے کہ ہمارے بنگلور کے بڑے وسیع پریڈ میدان مین ایک ہوائی جہاز اڑنیوالا ہے۔ ناظرین کو یہ بات سے بھی آگاہ کر دیتے ہین کہ پہلے مرتبہ مذکور جہاز اس میدان مین جو اندر کمپونڈ گہرا ہوا ہے اسمین ۳ بجے سے ½ ۴ بجے تک قریب ۳۰۰ فیٹ کے بلندی پر ہے پرواز کرتا رہیگا۔ اور اس جہاز کے عجیب و غریب کرشمے جو تحریر سے باہر ہین دیکھنے پر منحصر ہے۔ اور باہر کے صاحبون کو نظر نہ آئیگا اور ½ ۴ کے بعد وہ ہوا پر اڑیگا علاوہ اسکے ان سڑکون پر اطراف پہرہ سوجرس اور پولیس کا رہیگا کبن پارک، برگیڈ روڈ، سوتھ پریڈ روڈ، مین گارڈ کراس روڈ، کیولری روڈ وغیرہ جو اصحاب کہ ٹکٹ خرید کئے ہین اسکے سوا دوسرے صاحبون کو بہت دور کے فاصلہ تک بھی نظر نہ آئیگا۔ اور پریڈ میدان کے دایر و سایر مین بغیر ٹکٹ کے صاحبونکو چلنے پہرنے کی سخت ممانعت ہے۔ اور ہم عام لوگون کے فائدہ کے لئے بڑی جانفشانی اور عرق ریزی سے یہ چار آنے کے ٹکٹین حاصل کئے ہین۔ معزز ناظرین آپ بسہولت سے آگاہ ہین کہ ہمارے شہر مین کوئی تماشہ یا محویت کمال کا موقعہ ہوجاتا ہے تو گرانی ٹکٹ کے باعث اسکے دیکھنے کے لئے خاطر ملول ہوجاتے ہین۔ اس لئے عام صاحبونکے فائدہ کے لئے ہمنے یہ کام کیا ہے۔ اب صرف تھوڑی ٹکٹین باقی رہگئے ہین جلد جلد آکر خرید کرلین۔ ورنہ کف افسوس ملنے کا مقام ہوگا۔ اور پھر ایسا تماشہ دیکھنے مین نہ آئیگا۔ علاوہ اسکے کمپونڈ کے اندر ۶ بجے سے بارود جلیگی۔ فقط

ٹکٹ ملنے کی جگہ

مصطفےٰ خانصاحب منڈی مرچنٹ ابراہیم صاحب اسٹریٹ	کے ابراہیم صاحب اینڈ سنس تاجر پارچہ مینا چی کویل اسٹریٹ	مستان خانصاحب تاجر پارچہ بیدواڑی
عبدالرزاق صاحب تاجر پارچہ موچی بازار	لوہار عبدالرزاق صاحب نارائن پلے اسٹریٹ	عبدالحمید سیٹ صاحب کمرشیل اسٹریٹ

FLYING IN INDIA.—A native poster, in Urdu, announcing the flights in Bangalore. This is chiefly interesting from the fact that it calls attention to the legend that according to the Sacred Vedas the end of things mundane will take place a thousand years after a man has come flying. We are indebted to Mr. Ernest Esdaile for being able to reproduce this poster, who has presented a copy to the Royal Aero Club.

FROM THE BRITISH FLYING GROUNDS.

Brooklands Aerodrome.

ON Saturday last another interesting Bomb-Dropping and Alighting Competition was decided in the presence of a good number of spectators, with the following result:—1st, Mr. Merriam, Bristol biplane; 2nd, Mr. Knight, Vickers-Farman biplane. Messrs. Sopwith (Sopwith biplane), Hawker (Sopwith biplane), and Bendall (Bristol biplane) also competed. Mr. Sopwith dropped his bomb on the target itself, but a miscalculation in landing robbed him of a prize.

On Sunday the weather was ideal and brought out a large number of people to witness the Relay or Despatch-carrying Race, in which the pilots worked in pairs, each partner covering the course of 1½ laps, the first starting off with the despatch, flying round the course, then landing and handing despatch to his partner, who flew the course, and then landed and handed the despatch to the judge, the total time taken by each pair resulting in the first prize being awarded to Messrs. Hawker (Sopwith biplane) and Spencer (Spencer biplane), whose total time for the course was 9½ mins. Messrs. Barnwell (Vickers-Farman biplane) and Merriam (Bristol biplane) were second in 10 mins. 10 secs., whilst Messrs. Bendall (Bristol biplane) and Knight (Vickers-Farman biplane) were third in 10 mins. 12 secs.

Before the race started Mr. Hamel on a Blériot monoplane arrived from Hendon, and thrilled the spectators by the masterly manner in which he manipulated his machine. After a short stay, Mr. Hamel returned again to Hendon. Mr. Petre on the Martin-Handasyde monoplane did some excellent circuits at a great height.

Bristol School.—Last week no flying all day Monday, Tuesday, Wednesday and Thursday owing to wind and rain, work confined to hangars. Bendall out for trial of the air on Friday, taking Mr. Ewing, a new pupil, as passenger, Merriam closely following with Lieut. Mills, another new pupil, and up as passenger to Lieut. Empson for two trips, this pupil being now ready for solos. Bendall out again after breakfast with Lieut. Mills and Mr. Ewing. Merriam flying with Lieut. Todd for his first trip, and Mr. Ewing. Lieut. Empson then out for his first solos, making four very good straight flights.

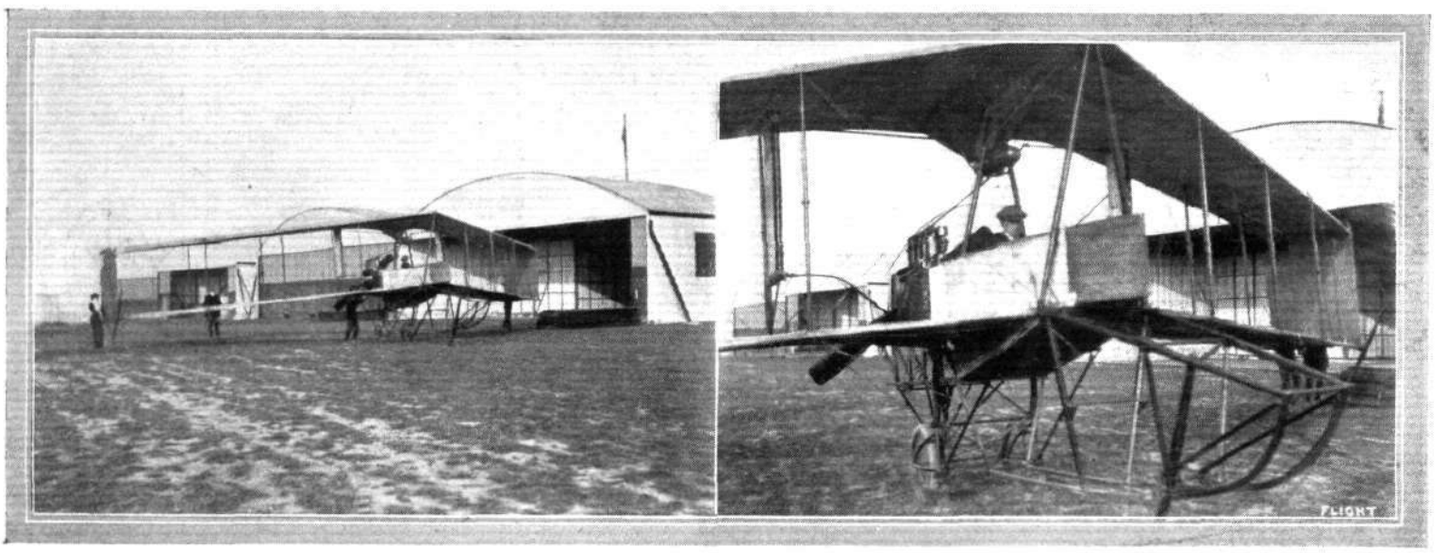
Bendall and Merriam were both testing a tractor biplane, recently erected at Brooklands, and found the machine to be quite a good flyer. Merriam finished morning's work by ascending with Mr. Featherstone to 2,000 ft. and making spiral *vol plané*. Merriam out first in the afternoon, taking Lieuts. Mills and Todd for flights, also out with Mr. Ewing. Lieut. Empson made several good straights. Bendall out with Lieuts. Todd and Mills and Messrs. Ewing and Featherstone.

On Saturday, Merriam made first trial, then going as passenger to Lieuts. Mills and Todd and Messrs. Loyd and Ewing. After breakfast, Merriam was up as passenger to Mr. Featherstone on straights, then with Lieut. Mills, who is getting on very well. Wind prevented further flying.

Bendall tested conditions in the afternoon, then taking Capt. Richards, a new pupil, for his first tuition flight. Merriam busy with Lieuts. Mills and Todd, and later up with Capt. Richards. Merriam and Bendall both contested for the bomb-dropping competition, Merriam proving the winner.

No flying on Sunday morning. Bendall first out in the afternoon with Lieut. Mills, Bendall following with Capt. Richards and Mr. Ewing, and also a lady passenger. Merriam and Bendall both entered for the relay race competition, whilst Merriam finished up the school work by taking Mr. Loyd for a flight; darkness prevented anything further.

Vickers School.—Knight was out on the Farman Friday morning, last week, for test flight, then handed machine over to Barnwell, who did some circuits, after which Mr. Corballis, on the same machine, put in some excellent straights and landed the machine very well. Knight then went out on the Farman giving instruction to Mr. Pollok. Barnwell was on No. 5 for circuits, and the machine being handed to Capt. Stott, the latter put in some very good right and left-hand circuits. Later in the morning, Barnwell out on the Farman with Mr. Pollok for instruction, afterwards the machine was under the control of Mr. Corballis, who is showing great improvement. Later on, Knight was out with, and instructing Mr. Pollok. Barnwell on No. 5 made a very pretty flight, after which Capt. Stott put the machine through some good circuits. In the afternoon Knight made test flight on Farman and then handed it over to Mr. Corballis, who made some excellent circuits. This pupil is now making rapid progress. Knight again up with Mr. Pollok for instruction. Barnwell out on No. 5 for another pretty flight.



A couple of new pilots on the Dunne biplane at the Royal Aero Club's Eastchurch flying grounds. On the left M. Montmain, and on the right Mr. Perceval.

Saturday, in the morning Barnwell on Farman with Mr. Pollok. Mr. Corballis up in the same machine for some very useful circuits. Later in the morning, Barnwell, on Farman, with Mr. Pollok, who is making great strides now. Mr. Corballis out for good circuits on Farman, followed by Knight with Mr. Pollok. Barnwell out for test flight on No. 5, after which Capt. Stott put in some good right- and left-hand circuits, and is now ready for his *brevet* flights.

Barnwell, Knight, and Mr. Corballis, on Sunday morning, all out on the Farman, Knight giving instruction to Mr. Pollok. In the afternoon, Barnwell out for excellent flight of 25 mins. over the surrounding country on No. 5, and up to 4,000 ft. Knight and Mr. Corballis out on Farman, and Mr. Pollok was given useful instruction by Knight, who occupied the passenger seat. During the relay race Barnwell had the misfortune to jump into the bracing wires of the Farman's elevator, and broke some of his teeth, and also sustained a fractured upper jaw. We all wish him a speedy recovery.

Knight out on Monday morning with Farman, giving instruction to Mr. Pollok, who is getting on very well. Mr. Corballis out for very good circuits on the same machine, and making good landings. In the afternoon, Knight, Mr. Corballis and Mr. Pollok were all out on the Farman putting in a good deal of useful work. Knight also on No. 5 for test flight, and then handed machine to Capt. Stott, who went for first part of *brevet* test, and did it very well. Knight then out for test flight on No. 3, after which Mr. Babbington did some very good rolling and long hops on the same machine. Later, Knight, Mr. Corballis and Mr. Pollok were all out on the Farman, both of the pupils doing very well indeed.

Eastbourne Aerodrome.

ON Thursday afternoon last week the high wind which prevailed during the early part of the week died down, and Mr. Hammond was out on the Bristol by about 3 o'clock. After making a solo he went up with Messrs. Roberts and Thompson, both pupils taking their turn in the pilot's seat. Mr. Lerwill was also out in the afternoon and put up an excellent flight.

Friday was another perfect day and some useful practice was put in.

On Saturday Mr. Hammond was busy with the pupils both in the morning and afternoon, he also gave several exhibition and passenger flights.

Sunday morning was quite calm, but a slight drizzle prevented any practice being done. The afternoon, however, turned out nice and fine. Mr. Hammond, with Yates as passenger, gave a fine exhibition flight, during which he flew right down the sea front, much to the delight of the people on the promenade. Mr. Fowler had his new 35-h.p. Anzani-Blériot out, and made two short flights. The machine looks extremely smart, and with one or two slight alterations should prove a very useful little 'bus. On returning from the sea front, Mr. Hammond took up Cookson for instruction, and flew over with him as far as Berwick, a village about 9 miles off. Unfortunately, the engine started to miss badly just as he was turning to come home and forced him to descend. By the time the trouble had been put right it was too dark to fly so the machine had to be left out all night. When the search party arrived, they found Messrs. Hammond and Cookson being entertained by a very hospitable gentleman whose house was quite near the field they landed in.

On Monday morning Mr. Hammond flew the Bristol home, and in the afternoon gave instruction to Messrs. Roberts, Thompson and Cookson.

Farnborough.

Royal Aircraft Factory.—Mr. de Haviland on BE 2 all through last week. Sunday, Lieut. Wadham left for Upavon with new Maurice Farman. On Tuesday, M. Verrier flew over from Brooklands on Maurice Farman, making his usual stunts, and finishing up by coming down from 1,000 ft. with his engine stopped. Mr. Petre ("The Painter") over from Brooklands on Martin-Handasyde, the machine behaving excellently under his capable pilotage. The construction and finish of the machine is very favourably commented on. On Monday and Tuesday Mr. Cody was out.

Royal Flying Corps.—No flying on Wednesday, Thursday or Saturday last week owing to climatic conditions. On Friday, however, Lieuts. Wanklyn, Playfair and Shepherd were on 213 doing circuits. Lieut. Herbert on 215 several long flights at 1,200 ft.; Capt. Brabazon on same machine doing circuits at 400 ft. Lieut. Longcroft and Capt. Webb-Bowen good flights on 206.

Monday, Major Burke on 206 at 1,000 ft. Lieut. Longcroft on same machine, observation flight over the surrounding country, coming down owing to engine misfiring. Capt. Beck on 215, with Lieut. Carmichael at 1,000 ft., Capt. Reynolds taking Sergt. Scovell for a trip at 800 ft. Lieut. Herbert three flights at 800, 1,000, 1,500 ft., the latter flight being a proficiency test in which the pilot has to rise to 1,500 ft., and descend *en vol plané*. Lieuts. Playfair, Wanklyn and Shepherd on 213, practising landing at a specified point.

Tuesday, 206 disabled owing to engine backfiring and smashing propeller. Capt. Beck on 215 made an excellent observation flight round Ash district with Lieut. Carmichael as passenger at 2,800 ft. Lieuts. Brabazon and Herbert, on same machine, several flights. Lieuts. Wanklyn, Playfair and Shepherd on 213.

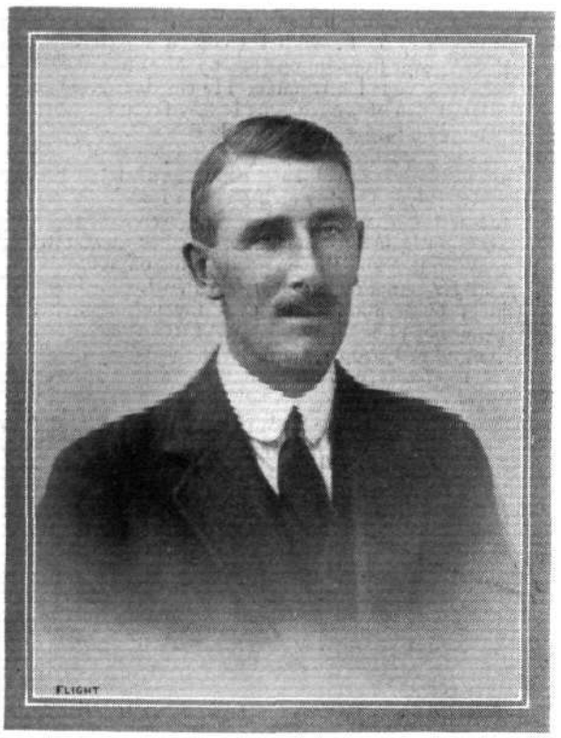
No. 1 Squadron, Willows airship out on Friday. Unfortunately came down at Cove, buckling the main boom of the nacelle, but she was safely towed back by bluejackets without further damage. "Beta" made several good trips on Monday and Tuesday, manœuvring well and showing a good turn of speed and stability.

Liverpool Aviation School, Waterloo.

MELLY did several straights Thursday last week on the school machine, which has just undergone complete overhaul; he also

"Flight" Copyright.

The visit of Mr. Maurice Farman to Hendon Aerodrome last Sunday, for the purpose of testing some of the machines built by the Aircraft Co. to his design, created a considerable amount of interest. He made several trial flights, and our picture shows him discussing points with Mr. Holt Thomas, with interested mechanics, &c., prior to one of his flights.



Lieut. R. B. Ritson, who this month took his *brevet* at the Bristol School at Brooklands, and gives every promise of being a very excellent flyer. No less than fourteen *brevets* have been taken at this school from the 6th of last month up to November 9th.

made one short flight on the Y machine. Next day Hardman had out the Y machine, flew over Ince Woods and Sefton, attaining a height of 1,700 ft. Melly then, on the same machine, flew round Hightown and Crosby, reaching 2,500 ft. Birch also steered in the same direction, and circling several times Sefton reached a height of 4,100 ft., and planed down in the neighbourhood of Seaforth. Shortly afterwards he took the machine up again, doing a variety of figures close to the hangars.

Melly took out the Y machine first on Saturday to test the weather conditions, doing a series of figure eights. Birch then followed with the intention of beating his previous height, and heading straight for Southport, circled round it and back to Waterloo, a distance of about 35 miles. He, however, only attained a height of 3,000 ft., being constantly enveloped in mists and clouds, which prevented him seeing the land below him.

Monday, Melly and Birch both out doing short flights to cor ect the balance, which had got a bit one-sided.

London Aerodrome, Collindale Avenue, Hendon.

Grahame-White School.—Friday, last week, school started work at 8.10 a.m., under the supervision of Chief Pilot Noel, Lieut. Birch doing 10 mins. solo straights in a slight wind. At 8.20, Lieut. R. G. D. Small got in a little rolling practice on No. 7 biplane, afterwards taking straight instructive flights with Mr. Noel; later in the morning, Major Madocks and Lieut. Birch taking it in turn to do straight flights on the No. 7 'bus. Mr. Davies rolling for over an hour on 4B machine under instruction of Mr. Manton, and showing good improvement. In the afternoon, Lieut. Birch doing circuits with Mr. Noel, and Mr. Carr afterwards doing straights with the same instructor.

There was some good exhibition flying to be seen at the London Aerodrome on Friday afternoon. Mr. Noel was out on the 80-h.p. Farman biplane with a lady passenger, while Mr. Manton made several exhibition flights on No. 7 biplane. At 4 p.m., M. Pierre Verrier started out on his Maurice Farman machine for a cross-country flight, which lasted over an hour, with a passenger.

Saturday, Lieut. Birch and Major Madocks doing solo straights under instruction of Chief Pilot Noel in a slight wind, and Mr. Power rolling with Instructor Manton. Mr. Noel out trying new Grahame-White-Farman type two-seater biplane, which flew very well.

People who visited the London Aerodrome on Sunday to witness good flying were not disappointed. The flying started punctually at 3 o'clock, Mr. Louis Noel making some fine exhibition flights and taking up several passengers on the 80-h.p. Henry Farman biplane. Mr. Desoutter was also to be seen making his usual high flights, as also Mrs. Stocks on a Blériot monoplane and Mr. Manton on No. 5 biplane. M. Pierre Verrier was also making fine flights on his Maurice Farman biplane, taking up several passengers, amongst whom was Mr. G. H. Mansfield.

Aircraft Co. School.—Friday, last week, Verrier was out testing new Maurice Farman, with Clement Greswell as passenger, flying over surrounding country for forty minutes. Next day he was flying all the afternoon, carrying numerous passengers.

Maurice Farman arrived at the aerodrome on Sunday, and was flying all the morning, making some very pretty flights. He carried Mrs. Holt Thomas and another lady for a short cross-country flight. He then handed the machine over to Verrier, who gave Mr. Mansfield a short spin round the aerodrome. During the afternoon Verrier was flying in his usual brilliant style with several passengers. On Monday, Verrier left Hendon, at 11.45, for Farnborough, with Clement Greswell as passenger, against a very strong head wind; he arrived there at 1 o'clock. In the course of the afternoon he passed the machine through the military tests before handing it over to the factory officials.

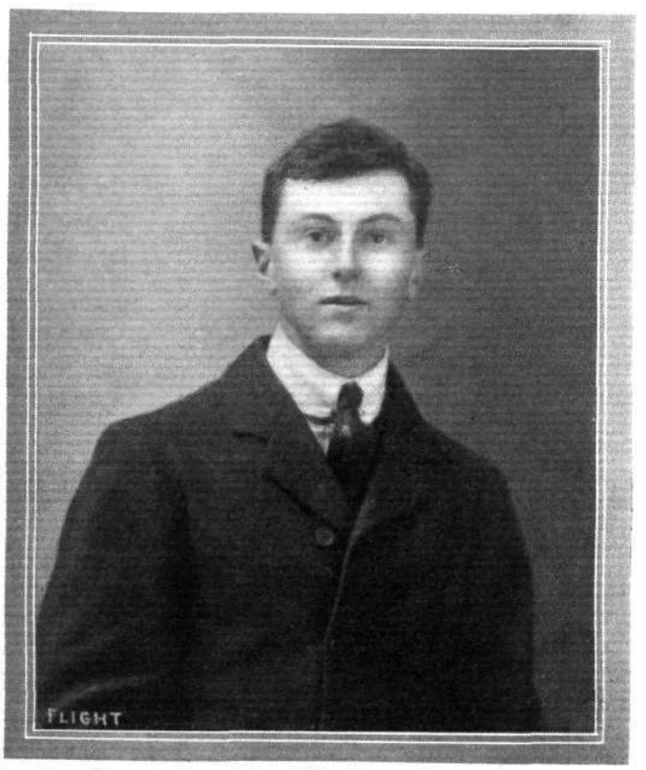
Blackburn School.—Owing to the very bad weather last week, the first opportunity for school work came on Friday morning, when at 7 a.m. Mr. H. Blackburn made a test flight of 10 mins. on the *brevet* machine, following which Messrs. Spink and Buss had each half an hour's practice. In the evening, Mr. H. Blackburn tested the air before Messrs. Buss and Spink did half an hour's practice each; then Mr. H. Blackburn brought out the newly reassembled rolling machine for a short flight.

Several short flights by Mr. H. Blackburn were put in Saturday and Sunday morning. Mr. H. Blackburn took the *brevet* and rolling machines for test flights, after which Dr. Christie got in a very useful hour and a half of practice in straight flights and landings; the control of the machine in the moderate side breeze entailed a lot of warp manipulation, which the pupil executed quite capably.

Blériot School.—No school work was possible during the early days of last week, owing to almost incessant wind and rain.

On Friday, however, a large amount of practice was done by Messrs. Gandillon, Reilly and Clappen, all of whom are doing straight flights with confidence on LB. 3. M. Gandillon was first in the air, and did quite a good flight. Clappen then took over the machine, and, although somewhat heavy on the controls, is rapidly improving. Mr. Reilly is also making quite good progress, having not long joined the school, and also is not able to be at the ground on all occasions.

On Saturday Mr. Clappen was doing straights, and is handling the machine much better.



Another Deperdussin pilot, Mr. Denis Ware, who obtained his *brevet* at Hendon recently on his first attempt on the Deperdussin *brevet* monoplane.

During the week Mr. R. B. Slack rejoined the staff at Hendon as works manager and assistant instructor—having been away for some months flying a 50-h.p. Gnome-Blériot on the tour throughout the British Isles organised by the International Correspondence Schools.

Deperdussin School.—The abominable weather in the early part of last week was responsible for several blank days, practically no school work being possible until Friday, when "Dep." 3 having arrived from the works, pupils and staff were busy tuning up, &c. Later, Mr. Whitehouse, Capt. Mapplebeck, and Lieut. Hawker all put in excellent practice in straight flights and landings, all making very satisfactory progress. Later, Lieut. Hawker did half a circuit, but darkness put a stop to further work.

Saturday weather again rather windy, but Mr. Whitehouse managed to put in some useful practice on Taxi No. 3. On Monday Captain Mapplebeck, Mr. Whitehouse and Lieut. Hooper put in some excellent practice on No. 3 *brevet* machine doing good straight flights and making very neat landings. Very satisfactory progress is being made by these promising pupils.

Lieut. Porte was also out during the afternoon testing the 80-h.p. Anzani two-seater intended for the War Office. The machine answered perfectly in every way and was remarkably quick in getting off the ground. It promises to be one of the most successful machines turned out by the Highgate Works.

Mr. Scott, the new pupil, managed on Tuesday to put in some practice on Taxi No. 2, but the rising wind prevented any further school work for the rest of the day.

W. H. Ewen School.—Owing to the unfavourable state of the weather, outdoor flying practice was impossible last week till Friday. The pupils, however, turned out at 7.30 a.m. that day, and under the instruction of M. Baumann and Mr. Sydney Pickles excellent work was got in. Lieut. McMullen and Mr. L. Russell were making good straights and well-judged landings on No. 2 monoplane. Lieut. M. W. Noel rolling well and showing good progress. Mr. Pickles, after a flight on the 35-h.p. Caudron biplane, gave Lieut. McMullen his first instruction on the Caudron, and the latter was flying straights and half-circuits in good style. After lunch Mr. Sydney Pickles was again out with the 35-h.p. Caudron, and under his instruction Mr. Lawford and Lieut. McMullen put in two hours' continuous practice, flying straights and half-circuits. M. Baumann had Lieut. M. W. Noel and Mr. L. Russell doing good work on No. 2 monoplane. As a finish up to a splendid day's work, Mr. Sydney Pickles brought out the 60-h.p. Caudron two-seater, and took up several of the pupils for air instruction.

On Saturday morning the pupils were out again at 7.30 a.m., and under the instruction of M. Baumann, Lieut. Noel and Mr. Russell, were busy doing straights on No. 2 monoplane. Mr. Sydney Pickles, after test flight on 35-h.p. Caudron biplane, handed over the machine to Lieut. McMullen, who put up some good straights and half-circuits, handling the machine confidently and landing well.

Salisbury Plain.

Bristol School.—No flying possible on Monday, wind and rain preventing any attempts. Work busily carried on in the hangars. Very strong wind blowing all day Tuesday, no flying possible; all pupils present and putting in another day on the machines in the hangars. Wednesday high wind again prevented any flying, and yet another day spent indoors. Wind very tricky Thursday morning No flying in the morning. Busteed took up one of the 80-h.p. monoplanes in the afternoon, but no other trips made.

On Friday Pizey was first up, taking Lieut. Rees, then with Capt. Penfold over *brevet* course, this pupil then going up for two very fine solos, in which he showed signs of considerable improvement. Pizey meanwhile out with Lieut. Rees for a trip on one of the tandem monoplanes, reaching 1,200 ft., then with the same pupil in biplane for two flights. Lieut. Rees is making really excellent progress and although only at the school a few days will commence solos at the next opportunity. Busteed out for a test of one of the monoplanes, after which nothing further was attempted in the morning. England took Lieut. Rees for tuition in the afternoon. Capt. Penfold making two really good solos, whilst Sippe went up for a practice flight on tandem monoplane, but no other ascents were made.

England was the first away on Saturday morning for a trial, afterwards giving four tuition flights to Lieut. Shekleton, giving the pupil plenty of practice in landing. Capt. Penfold was up for three good solos in the course of the morning and should very soon obtain his *brevet* quite comfortably. Pizey made a good solo on the tandem monoplane, also taking Lieut. Shekleton for tuition in biplane. Busteed was up in the side-by-side monoplane. Sippe being out, first on a biplane, and then on a tandem monoplane.

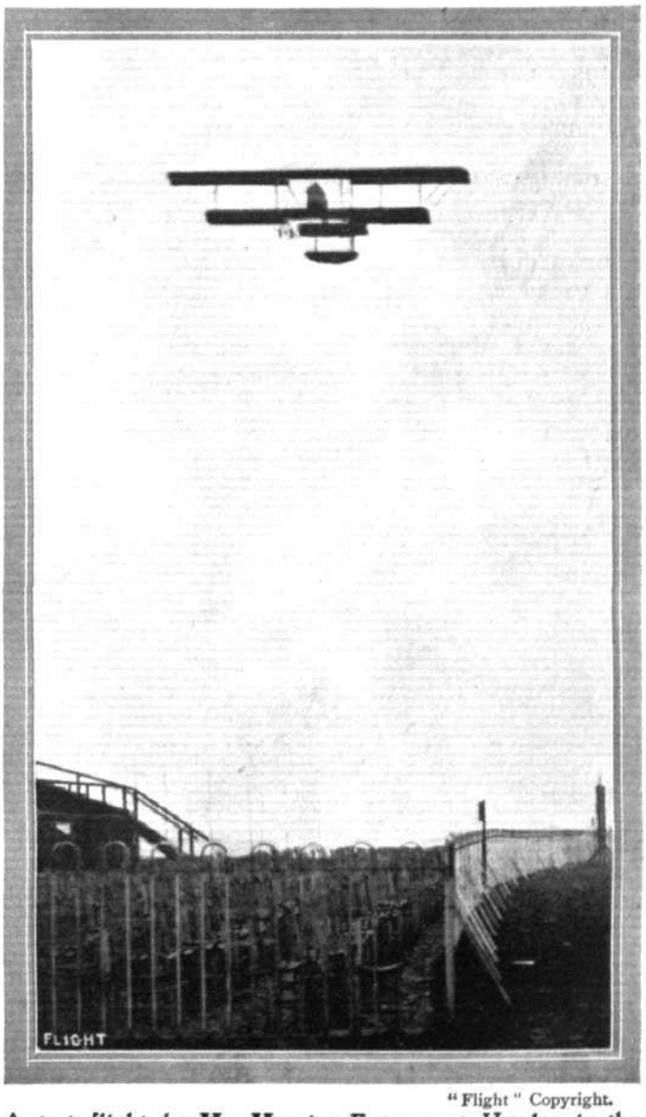
Lieut. McArthur passed the tests for the second part of his *brevet* in good style in the afternoon. Capt. Penfold made two fine solos, Pizey taking Lieut. Shekleton for tuition.

Royal Flying Corps.—The first flying last week was seen on Thursday, when Lieut. Lawrence and Capt. Allen made trials on biplane 205, and Lieuts. Wadham and Porte were also out, while Mr. Percival was flying very high on the Dunne biplane. The same officers were out in the evening, when Lieut. Wadham, in one of his four flights, climbed to 2,700 ft. Lieuts. Fox and Ashton were also out on 203. On Friday morning, Lieut. Lawrence made an hour's flight on 205, and this machine was afterwards used by Capt. Allen Lieuts. Wadham, Porte and Ashton, while Lieut. Fox was practising on 203. Mr. Percival made an hour's trip on the Dunne machine, the greatest altitude being about 2,500 ft. In the evening there was a good deal of flying by the various officers, and Major Brooke-Popham took a turn round the Plains on 205. On Saturday morning Mr. Percival, on the Dunne biplane, was the only one out, and he made a very good flight. In the evening each of the officers had a practice flight on either 205 or 203.

Brooklands Competitions.

ON Saturday, the 23rd, at 3.30 p.m., a Quick-Starting Competition will be held, and the competitors will include, on biplanes: Mr. Hawker (Sopwith), Mr. Merriam (Bristol), Mr. Spencer (Spencer), Mr. Bendall (Bristol), Mr. Sopwith (Sopwith), Mr. Pashley (Sommer), Mr. Barnwell and Mr. Knight (Vickers-Farman).

On Sunday, at 3.30 p.m., a Speed (2 laps) Handicap will be decided, and the following will compete:—Monoplanes: Mr. Barnwell (Vickers), Mr. Petre (Martin-Handasyde), Mr. Raynham (Flanders). Biplanes: Mr. Knight (Vickers-Farman), Mr. Pashley (Sommer), Mr. Spencer (Spencer), Mr. Sopwith (Sopwith), Mr. Merriam and Mr. Bendall (Bristol), Mr. Hawker (Sopwith), Mr. Percival (Caudron), Mr. Ducrocq (Farman).



"Flight" Copyright.

A test flight by Mr. Maurice Farman at Hendon in the British-built machine of his own design.

EDDIES.

YES, it is good to get back to the aerodrome again, after sundry wanderings, to see the same old cheery faces—and many new ones too—to get a sniff of burnt castor oil, and to hear the old familiar Gnome rattle.

Seeing flying again, after even an absence of only four months or so, the mind cannot help reverting to the conditions of things in the early days of the game and pondering on all the rapid changes that have occurred since then. After all, aviation as we know it to-day is scarcely more than three years old. But what a long three years it has seemed; what a lot has happened in the time!

* * *

Then you would find an aeroplane being built in a garage or any old shed that would serve to keep out some of the mud and wet. Your plant consisted chiefly of a set of millimetre drills, a hammer, a vice, your pliers and wire cutters, a hacksaw, and a shifting spanner. Yet what a lot of work used to be got through with these simple tools, for it was the intense enthusiasm of the thing that carried you through. Little did you mind having hands like slabs of raw beef through being too vigorous in trimming off loose ends of 12-gauge piano wire with a pair of antiquated cutters. And when the machine was shipped out to the open field for testing, what transports of joy were yours if it only hopped even a yard or two! At any rate, it had got off the ground, and that was something that you were justified in being very proud of, for many, perhaps most, of the other machines couldn't even get as far as that.

* * *

My mind takes me back to one in particular. The inventor claimed that a machine similar to the one he had built, but perhaps a little larger, would be capable of crossing the Atlantic with 24 passengers up. Its shed was kept severely locked, and all the windows were well covered up. At last it was brought outside on the ground. I won't describe the machine for fear its inventor, reading these lines and recognising it, takes it into his head to descend on me in all his wrath. The engine, a heavy one—seemingly taken from a motor 'bus chassis—was started, and three sturdy mechanics dug their heels into the mud and clung to the tail to prevent it bounding forward. The inventor took his seat after scrutinising all the wires. Yes! the motor was going beautifully. He waved for those behind to let go. They did, and waited open mouthed while nothing happened. The pilot—he did not look round—waved again, this time angrily. But his men had already done all they were expected to do. Then he looked round, went pale, switched off the motor and got out of the machine. Instead of rushing forward over the ground, his machine had merely vibrated itself down hub deep in the mud.

* * *

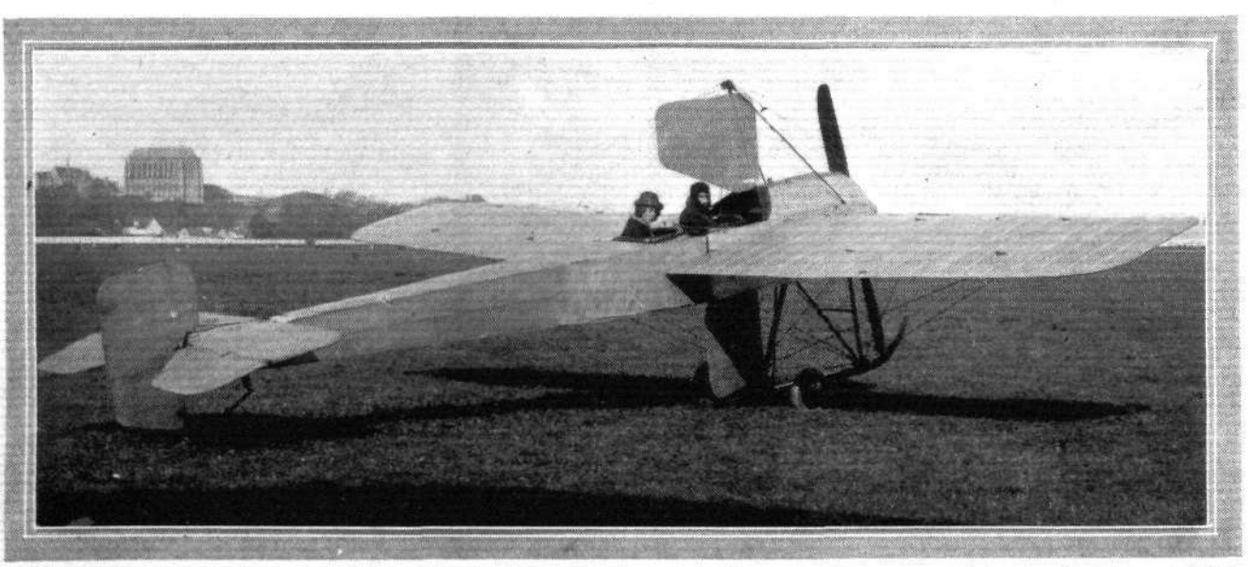
Nowadays, aeroplanes are constructed in well regulated factories. You hear the hum of metal and wood working machinery, and you notice that the men, arriving and leaving their work, "clock" themselves in and out of the works gate. Whenever a new machine appears, you know pretty well what will happen. The pilot will fly a straight or two, then he'll do a few left-hand circuits, a right hand turn, and finish up with a *vol plané*. Back three years, and even less, right hand turns and *vol planés* were looked upon as unnatural and unsafe. Yet to-day everyone does them.

Aviation, for most of those in the running now, is no longer an exciting hobby; it is a serious business.

* * *

All this meditation whilst walking across the fields to the Hendon Aerodrome last Sunday morning to see M. Maurice Farman fly one of the magnificent biplanes that the Aircraft Company have built at Hendon under his licence.

Like his brother Henry, Maurice Farman is no "stunt" flyer. He just takes the machine up for the purpose for which it was intended—to carry him safely through the air. Altogether he made three flights, the first a solo, the second and third passenger flights with Mrs. Holt Thomas and a lady friend of hers. But he did not remain at the aerodrome long. Just sufficient time to look round the works, inspect the biplanes, make these three flights, and he was speeding away from the aerodrome in Mr. Holt Thomas' car, while Verrier, in the machine Maurice Farman had flown, flew overhead by way of a parting salute.



A NEW MONOPLANE AT SHOREHAM.—This machine, which incorporates a new idea in obtaining stability, has been built to the designs of Lieut. R. Burga by Messrs. A. V. Roe and Co. Further reference to it will be found in the "Eddies."

After spending some time in the Aircraft Co.'s Works at Hendon, Mr. Maurice Farman expressed his entire satisfaction with the British-built machines, which he saw for the first time, considering them in every way equal to the French construction. He afterwards made visits, with Mr. Holt Thomas, to the Central Flying School at Upavon, the Royal Aircraft Factory, and the Military Wing R.F.C. at South Farnborough, flying a machine at each place.

• • •

"Coming for a stunt round?" "Rather!" So it was fixed up, and within two minutes I was fortunate enough to be a passenger by the side of one of our cleverest pilots, flying around a couple of hundred feet up in the new 70-h.p Handley Page monoplane.

There is no mistaking whether you are flying or not when you get in that machine. Inside the cockpit it's cosy enough, in all conscience, but as soon as you poke your head outside the wind feels as though it were a big hand trying all it can to push your face out flat. The point that struck me most was the remarkable stability of the monoplane. Its wings are shaped to give natural stability, and they certainly act up to all that is claimed for them.

• • •

At the northern end of the Hendon ground, above the trees, there is usually in operation a series of more or less malignant *remous*. They were at it fairly vigorously on Sunday, so a biplane pilot told me. Otherwise I should have thought they were taking a rest, for in the Handley Page they were scarcely noticeable. Neither did the pilot move his controls at all while flying through them. He simply let the machine look after itself. He did no warping at any time excepting to counteract the machine's natural bank in turning, for the monoplane has a tendency to bank just a little more than is to his complete liking. But what a fine machine she is!

• • •

The Bard of Hendon!

He sells vegetables, ginger beer and picture postcards. But it is not at this that he excels so much as at composing verse. Here is an example which is pinned up in a postcard showcase outside his shop. It may not be accurate to a word, but it is as near to the original as my memory can take me:—

I diddle diddle.
Hamel flying to the tune of a fiddle.
Turner *vol-planing* over the moon.
And it made us all start,
When White flew in the dark,
And Cody combated with a cow!!

• • •

Quite an interesting machine has made its appearance at the Shoreham aerodrome. It is a monoplane which has been built to the designs of Lieut. R. Burga of the Peruvian Navy by Messrs. A. V. Roe and Co., whose flying school, it will be remembered, took up its quarters there some time since. From the photograph of the machine we are able to reproduce this week, it will be noticed that it is novel in having two vertical rudders, one above and the other below the fuselage, just forward of the pilot's cockpit. It is to these rudders that the maintenance of the craft's lateral stability has been entrusted, for no provisions have been made so that the pilot can control this by wing warping. The wings themselves are constructed on a principle that enables them to vary their camber according to the speed at which it is desired the machine should fly. With Lieut. Burga's permission we hope to be able to review this machine in a future issue.

It is of unusual interest to hear that Mr. H. Barber, whose opinions on matters relating to aviation are so highly valued, left suddenly for Constantinople a week ago yesterday.

• • •

Jules Nardini, too, is intending to go abroad, and in all probability will be in Venice by the time these lines appear in print. It is to test a new hydro-monoplane that has been designed and built by Lieut. Calderara, that he is going there. In its design, so I learnt during a chat with Nardini on Tuesday last, it is unlike any machine flying to-day, in that a platform is provided, so that the four passengers the machine has been designed to carry may promenade to their heart's content. For its wings, they are not merely coupled up to the body of the machine by steel cable triangulation, but are braced on the open girder system that characterised the Blériot test aerobus that the late Lemartin flew at Pau last year. A 100-h.p. Gnome is fitted which can be started by a mechanic on board the machine. Already some considerable amount of success has been met with during tests that have been carried out at Spezzia, where the machine was built. It has remained in the air for periods up to one and a half hours.

• • •

Lieut. Calderara is the most experienced flying man Italy possesses. His acquaintance with the art dates back to the early part of 1909, when he was learning to fly under the tuition of the late Wilbur Wright. He was that pioneer's first Italian pupil. He had a very serious smash away back in those early days, but fortunately he recovered sufficiently to enable him to compete in the Brescia meeting in the September of 1909, where he won £1,440 in prize money, and carried off the King's cup. From the biplane he turned his attention to the speedier single-decker, and did a great deal of flying. He was recently appointed instructor to the hydro-aeroplane pupils undergoing tuition at the Italian Government School at Venice.

• • •

The people of Sheerness are not altogether alone in their ability to hear German airships passing overhead. A correspondent writing to the *Edinburgh Evening Dispatch* has also seen a mysterious manifestation, over which he became so uneasy that he was prompted to communicate his experience to the Press. He says that from his window overlooking the Firth of Forth he saw a luminous object, high in the air, approaching westwards rapidly. Attaining the coast, it hovered for a short while, and then flew off in the direction whence it came. He further remarked that the craft, whatever it was, was shaped like a cigar. Some time after the disappearance of the first apparition a second one appeared and repeated the performance. This one, however, had the shape of a crescent. What a lot of pleasure Germans must get out of seeing us periodically scared, and what a a big pity it is that the Government allows it to continue. I do not pretend to speak as an expert, but this much I know, that my pride for my country suffers when it becomes so painfully evident that Germany can terrorise us with her Zeppelins.

"OISEAU BLEU."

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More Military Aviators for France.

THE French Minister of War has now approved a list of 47 officers and 52 non-commissioned officers and men of various branches of the service who are to undergo courses of instruction in aviation. For the preliminary stage of their practical instruction the officers will be divided between Rheims and Avor Camp, while the non-commissioned officers and men will be divided between St. Cyr and Chalons Camp.

FLIGHT

NOVEMBER 23, 1912.

AEROPLANES IN THE LIGHT OF THE MILITARY TRIALS.

By A. E. BERRIMAN, A.F.Aë.S., *Technical Editor of* FLIGHT.

Paper read before the Aeronautical Society of Great Britain, on Wednesday, November 13th, 1912.

Lieut.-Gen. Sir H. L. SMITH-DORRIEN, K.C.B., D.S.O., in the chair.

PICTURE an imaginary aeroplane of constant power output having wings that grow smaller as the speed increases, and suppose that the change of area with speed is such that the loading in lbs. per sq. ft. of wing surface is always given by the expression $V^2 \div 900$, where V is the speed in miles per hour.

Let it further be supposed in respect to this imaginary aeroplane that it grows lighter as it flies faster, and let the weight vary inversely as the speed.

Thirdly, let it be supposed that the resistance to motion is always one-sixth of the instantaneous weight of the machine at all speeds.

Finally, let it be supposed that the propeller has 80 per cent. efficiency at all speeds.

Let a graph be drawn to illustrate $V^2 \div 900$.

Let another graph be drawn to illustrate $1{,}800 \div V$.

Let both graphs be drawn on one chart with ordinates of miles per hour velocity and abscissæ of pounds weight.

Let the scale of the abscissæ marked on one side of the graph be called weight per h.p., while that opposite is called lbs. per sq. ft.

Such a chart will illustrate the case of the hypothetical aeroplane defined above.

Such a machine cannot actually exist, but a real aeroplane might, individually, represent one of its instantaneous conditions, and a series of aeroplanes might, collectively, cover a considerable range of its chart.

For this reason, I think it is interesting as a line of thought, although not necessarily useful for practical purposes, to compare the machines in the Military Trials with the chart.

Thus, for any given machine, we may take its weight per h.p. as an index to the chart and compare the actual wing loading and actual speed with those indicated as appropriate to the hypothetical condition. Alternatively, we may take the actual wing loading or the actual speed as the index and do likewise.

From this comparison, it may be possible to gain some idea of the effect of an alteration in either the weight or the wing area of a given machine, and if the chart in any way facilitates such an estimate, it might serve a useful purpose in doing so.

For the sake of being as definite as possible in the attempt to deal with this comparison verbally instead of merely placing the data graphically on the chart and leaving the conclusions to be drawn as others may see fit, I have supposed, purely for the sake of argument, that such a comparison is permissible.

This, it seems to me, is the most certain way of enabling others to judge for themselves whether or no it has any interest or value.

Criticism will thus fall under three heads:—

a. That the graph is incorrectly drawn to represent the hypothetical case.

b. That the date of the Military Trials shows the hypothetical case to be useless.

c. Or that, showing it conceivably to have some use, the deductions at present drawn are incorrect.

It will be understood that the hypothesis states interdependent conditions. Any alteration in one condition of necessity involves alteration in other conditions, otherwise the hypothesis would be stating an absurdity.

Thus, no machine can move faster unless its power increases or its resistance decreases. In the hypothesis, the power is assumed constant in order to meet the case of a given engine employed on a variety of machines intended to fly at different speeds while carrying different loads. Under the hypothesis of constant power and increasing speed, therefore, the resistance *must* decrease with the speed.

In one and the same machine, such a decrease is obviously limited by the weight being constant. But a series of different machines (which is what the hypothesis is really intended to cover) might usefully carry different loads per unit of power, which would meet the conditions of the chart over a wider range.

The coefficient of resistance in terms of the weight is assumed to remain constant, because in an elementary aerofoil the coefficient of resistance is independent of velocity, provided that the angle remains unchanged while the area adjusts itself to the V^2 law and the weight, and that skin friction is $\propto V^2$.

If the area is not properly adjusted to the speed in accordance with the hypothesis, it will involve a reduction in the coefficient of resistance assumed in the hypothesis. Thus, if the area becomes too small, the weight per h.p. must be less, or the resistance coefficient must be less, or the appropriate wing-speed will not be attained. Alternatively, if the wings remain too large, the total lift will increase with speed, which again involves either a reduction of the resistance coefficient or an increase in the power.

It is not suggested that an actual aeroplane cannot demonstrate a departure from the assumed *numerical* values of the chart, but it is inferred that no machine can violate the primary *laws* on which the chart is based, and it is suggested, therefore, that such a chart facilitates an appreciation of the significant distinctions between the performances of different machines.

When the result of comparing proposed data with the chart is an indication that the power apparently required is different from the stated value, the former may be expressed as a percentage of the latter. I call the power apparently required, to fly the stated weight at the speed that the chart indicates, as appropriate to the stated loading by the symbol ϵ, which expresses the value as a percentage of the power stated to be available. If ϵ exceeds the value 80 per cent., which serves as the basis of the particular chart illustrated, then ϵ may be regarded as the "efficiency" anticipated.

The improvement necessary to satisfy the conditions, however, may be assumed to be located in the actual propeller efficiency or in the resistance coefficient; but some real improvement must have been accomplished in one or the other, or both, for the machine to satisfy the conditions.

Incidentally, it is of interest to note from the particular chart given that the product of weight per h.p. and weight per sq. ft. (both in lbs.) is everywhere twice the flight speed in miles per hour. The product of the two terms I call X; thus $kX = V$ where k is a constant for any given chart. For the particular chart given, $k = \cdot 5$, but it may have any value compatible with the basis on which it is desired to establish a comparison.

Desiring to establish a basis of comparison near, but still within, the limits of modern attainment, I have analysed the actual flight speeds attained in the Military Trials by the aid of X, and therefrom have deduced that $k = \cdot 5$ would provide the desired basis. It is important to bear in mind, therefore, that X is an effect produced by the hypothesis and not the cause thereof. Also, that the constant k merely determines the scale for any particular chart.

1. With this explanation I now turn to the detail text of my paper, which first shows the origin of the numerical values assumed for the hypothetical case.

2. The Military Trials cost about £14,000, and these figures, therefore, cost several pounds apiece to collect; they should need no further introduction to ensure your interest.

3. The aspect of the aeroplane on which I shall try to throw the light of the Military Trials is that concerned with a relationship between wing area, weight and power.

4. Weight involves resistance. Power overcoming resistance involves speed. Resistance and speed equated to power involve efficiency.

5. Now let me analyse the figures in the table, so as to provide data for the subsequent synthesis.

6. If I multiply the gliding resistance of an aeroplane by its maximum flight speed, I get the figures under "T.V. max." in the table.

7. If I establish a ratio between T.V. max. and the known H.P. of the engine, I get figures of efficiency that, at least, were actually attained. These values appear under E_1 in the table.

8. The best E_1 is about 80 per cent.

9. If I divide the weight in flight by the power, I get the weight per h.p. (W_1).

10. Variation in W_1 is small, most machines carried about 24 lbs. per h.p.

11. The gliding angle is shown in the table under G.

12. Most machines achieved a gliding angle of at least 1 in 6.

13. Most machines, therefore, experienced a gliding resistance of about 4 lbs. per h.p.

14. Divide 80 per cent. of 1 h.p. by 4 lbs. and the result is a speed of 75 m.p.h.

15. All machines carrying 24 lbs. per h.p. should, therefore, have achieved 75 m.p.h. flight speed if they were of equally low resistance in design, and if the effect of wing loading is ignored.

16. Look at the wing loadings in the table, they vary much more than do the weights per h.p.

17. Let us compare four machines at random having nearly the same weight per h.p.

Thus :—

Hanriot 1...	...	6·4 lbs. per sq. ft. wing loading.
Blériot sociable	...	4·8 ,, ,, ,,
Bristol 14...	...	8·75 ,, ,, ,,
Cody ...	...	5·55 ,, ,, ,,

18. Generally speaking, the reason for using larger wings is in order that a machine may *be able* to fly more slowly than before.

19. It would appear, therefore, that the above machines are *intended* to have different normal speeds, as they have widely different wing loadings.

20. Presumably all the intended speeds are below the limiting value of 75 m.p.h., which corresponds to the 24 lbs. per h.p. for the maximum demonstrated $E_1 = 80$ per cent., but, it will be interesting to enquire whether the designer of the machine with the highest loading may not have *anticipated* flying at a higher speed than this.

21. If he did so, then clearly he also anticipated realising a lower resistance than usual, or a higher transmission and propeller efficiency than usual.

22. If E_1 represents the transmission and propeller efficiency *actually* demonstrated, then let us call the efficiency anticipated when the resistance is assumed to be one-sixth of the weight ϵ.

23. It has been shown that E_1 has a maximum value in the order of 80 per cent. If, therefore, the value of ϵ appreciably exceeds this, it is clear that the designer expects to attain a better overall combination of high-propeller efficiency with low body resistance at high speeds than was achieved by any machine in the Military Trials.

24. In the absence of exact information, I suggest the following method of roughly estimating *a* speed that is appropriate to the wings, having regard to the load per h.p.

25. W_1 (wt./h.p.) is proportional to V^{-1}.
W_2 (wt./sq. ft.) ,, ,, V^2.
$W_1 W_2$ is, therefore, proportional to V.
I call $W_1 W_2$ by the symbol X.

26. In X, I have therefore a term in some way related to the speed that is appropriate to a machine having the stated W_1 and W_2; and we may write $kX = x$ where x is the appropriate speed in miles per hour.

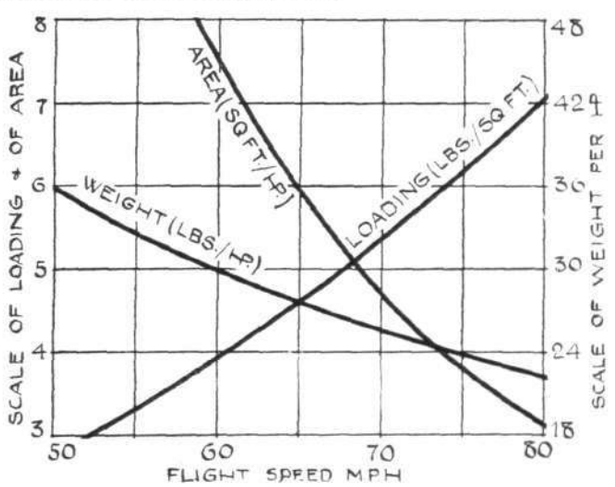
27. Now, for the machines in the Military Trials, we know X and we also have actual values for V. Dividing X by V, I shall, therefore, evolve a series of plausible values for k.

28. Having done so, I find k has a value in the order of ·5, that is to say, $\frac{1}{2}X = x =$ a speed appropriate to the design.

29. In selecting a certain value of k, I am selecting certain machines that have this factor in common but may differ in respect to W_1 and W_2.

30. One machine that has $k = 2$, exactly, has $W_1 = 23·7$ and $W_2 = 6·34$; an imaginary machine that plausibly might have $k = 2$ also, could be conceived with $W_1 = 24$ and $W_2 = 6·25$. For such a machine, $X = 150$ and $x = 75$ miles per hour. That is to say, at 75 miles per hour the lift of the wings is 6·25 lbs. per sq. ft.

31. Now let this imaginary machine possess the qualities set forth in the hypothesis of the opening paragraph, and construct a graph as there directed to illustrate the case.



32. This chart has two principal graphs, and a third that is derived from them.

33. The basic curves are weight per h.p. (W_1) and weight per sq. ft. (W_2), both plotted to lbs. and m.p.h. The supplementary curve is their quotient expressing sq. ft. per h.p.

34. Taking the two basic graphs independently, their characteristics result from plotting $W_1 \propto V^{-1}$ and $W_2 \propto V^2$ respectively.

35. The function of k in respect of the chart is to locate the position of the loading graph (W_2) relatively to the graph of W_1, which is based on a resistance of $\frac{1}{6}$ of the weight, and a transmission and propeller efficiency of 80 per cent.

36. Given any weight per h.p., the chart indicates the appropriate speed x and the appropriate loading on the same ordinate.

37. Here are the values of x for the four machines under review :—

Hanriot 1	...	$x = 77$	m.p.h. speed approximate to the wings
Blériot sociable	...	$x = 66$	,, ,, ,, ,,
Bristol 14...	...	$x = 90$	,, ,, ,, ,,
Cody ...	...	$x = 71$	,, ,, ,, ,,

38. Having established a series of appropriate speeds, we can multiply them by their respective weights per h.p., and so can calculate the corresponding values of ϵ.

39. Thus :—

Hanriot 1	...	$\epsilon = 82$ per cent.
Blériot soc.	...	,, 72 ,,
Bristol 14	...	,, 97 ,,
Cody ...	...	,, 75 ,,

40. ϵ is the percentage of the power available that is required to fly the machine at its appropriate wing-speed, x, against a resistance of one-sixth of its weight.

41. Now let us compare ϵ with the actual efficiency, E_1, as calculated from the gliding resistance and the maximum speed.

42. Thus :—

Hanriot 1	...	Demonstrated 73	per cent. E_1
Blériot sociable	...	,, 73	,,
Bristol 14	...	,, 81	,,
Cody ...	...	,, 69	,,

43. Reverting to para. 36, if the loading exceeds this value, the appropriate wing speed is increased, which necessitates anticipating more than 80 per cent. ϵ.

44. If the loading is less than this value, the appropriate wing-speed is reduced, which leaves a margin of power in reserve.

45. If the loading is very much less, the large size of the machine may interfere with the realisation of a very high E_1, owing to disproportionate head resistance at high speeds.

46. Any departure from the exact value for W_2 involves a departure from the hypothesis of $\epsilon = 80$ per cent.

47. The graph of W_1 is what the machine gets credit for doing when the actual efficiency is calculated on a resistance of 1 in 6. The graph of W_2 is an index to the wing effect on the ϵ anticipated.

48. To design for a low ϵ does not mean that one anticipates building an inefficient machine, but one that is making provision for a wide margin of power.

49. To design for a high ϵ means that one is designing for high speed without reference to speed range.

50. In some respects, the design of a low ϵ machine is antagonistic to a realisation of a high E_1.

51. ϵ is derived from the product of kX and W_1, which is to say that it is a function of the product (weight per h.p.)^2. (weight per sq. ft.).

52. Since weight per h.p. appears in its second power, lightness is all important in designing for a low ϵ, if the object is also to realise a high E_1.

53. The supplementary graph on the chart (area per h.p.) shows how far the power may be increased or reduced on a given machine without departing from the hypothesis.

54. Divide the old wing area by the new engine power to find the new index-point on the graph of area per h.p.

55. If the weight added or saved by the change in engines still keeps W_1 and W_2 within the limits prescribed by their respective graphs, where they are intersected by the new ordinate, the alteration is tenable.

56. The graphs, W_1 and W_2, show limiting values that comply with the hypothesis.

57. The graph (area per h.p.) is of secondary use in design, because the engines on the market are made to specific powers and the arbitrary selection of a motor is, therefore, an *initial* step in design, to which the wing area must be adjusted.

58. We will now consider each machine in the table :—

Hanriot.—If these machines were built mainly to fly fast against a 1 in 6 resistance, it was proper to design them for 80 per cent. ϵ. They realised a speed appropriate to their wings, and thus justified their design. In this I fail to find any support for the comment in the official report, which says the wings of these machines were "rather small."

Observe, however, that Hanriot 1 glided better than 1 in 6, and that its realised efficiency is less than the anticipated value. This indicates that either the resistance is increasing quickly with speed, or that the engine and propeller were unable to turn fast enough to take advantage of the low resistance. As Hanriot 2 has a higher gliding resistance at a higher gliding speed, it would seem as if the demonstrated efficiency for Hanriot 1 ought also to have been

Military Aeroplane Trials Analysis.*

	Effective H.P.	W_1.	W_2.	X.	x.	V max.	k.	G.	TV max.	ϵ %.	E_1 %.	R%.
Hanriot 1 ...	80	24·0	6·4	153	77	75·2	·49	6·6	58·5	82	73	25·6
,, 2 ...	80	23·7	6·34	151	77	75·4	·50	5·9	64·9	81	81	13·2
Blériot tandem...	60	25·0	5·77	147	73	60·8	·41	5·6	43·5	81	72	17·5
,, sociable	60	24·7	4·8	118	66	58·9	·49	5·3	44·0	72	73	47·3
Avro	65	27·2	5·28	144	70	61·8	·43	6·5	44·9	84	69	25·4
Bristol mon. (14)	75	24·5	8·75	214	90	70·5	·34	6·5	51·5	97	81	3·2
,, (15)	75	25·0	8·9	222	91	72·9	·327	—	—	100	—	26·0
British Dep. ...	80	24·2	6·3	152	76	68·2	·45	6·2	59·7	81	75	26·0
Maurice Farman	72	26·8	2·9	78	51	55·2	·71	6·8	42·3	61	58	47·6
French Dep. ...	80	23·4	6·1	143	75	69·1	·49	5·4	63·7	78	79	17·1
Cody	120	23·8	5·55	131	71	72·4	·55	6·2	83·5	75	69	49·4

* A more complete set of tables is available in the "British Military Aeroplane Trials," published at the Offices of FLIGHT, 6*d*.

Summary of Abbreviations and Formulæ.

$X = (\text{wt./h.p.})\,(\text{wt./sq. ft.})$
$= W_1 \cdot W_2$
$= fV^{-1} \cdot fV^2$
$= fV$
$\therefore kX = x = V$

$k = V \text{ max.} \div X$

$\epsilon = W_1 x$
$= \cdot 5 W_1^2 W_2$
$= \cdot 5\,[\text{wt./h.p.}]^2\,[\text{wt./sq. ft.}]$

TV max. = gliding resistance × max. speed
G = gliding resistance 1 in G
W_1 = wt. per h.p.
W_2 = wt. per sq. ft. wing loading
$X = W_1 W_2 = fV$
$x = kX$
V max. = actual speed
$\epsilon = W_1 x$ = percentage of the power available required to fly at x.
R% = speed range as an increase on minimum

calculated on a higher resistance. In fine, these machines are well proportioned as to their basic dimensions, having regard to high speed being the purpose for which they were built.

59. **Blériot Tandem.**—The Blériot tandem was designed for 81 per cent. ϵ, which is justifiable in a high speed monoplane. It realised only 72 per cent. Unlike the Hanriot, however, its gliding resistance was high, and, in this case, it is the failure to attain the speed appropriate to the wings that is the cause of the low efficiency realised, as compared with the high efficiency anticipated. In fine, the Blériot tandem ought to fly faster than it does for its power, if it is intended for the high speed monoplane class.

The official report in referring to the 50-h.p. prototype of this model suggests that "it would appear that . . . . . considerable difficulties are experienced when a more powerful type is called for."

60. **Blériot Sociable.**—The Blériot sociable was designed for only 72 per cent. efficiency, and demonstrated 73 per cent., as much as the tandem. It did not realise the flight speed appropriate to its wings. The speed range of the machine is very high for a monoplane, but an attempt was made in the trials to exaggerate the range unduly.

61. **Avro.**—The Avro was designed as a low-resistance biplane. Its gliding angle is good, but not such as to justify an anticipated efficiency of 84 per cent. The realised efficiency was 69 per cent., which is good for a biplane, but it was insufficient to enable the machine to fly at the speed appropriate to its wings.

If the machine had 15-h.p. more power for 100 lbs. extra weight, the new ϵ would be nearer to the present E_1, and the new appropriate wing speed would only be a reasonable increase on the present velocity attained.

The official report considers the machine to be "under engined," which I think is a justifiable comment. It reflects no discredit on the Green, the only British engine to go through the Trials, which put up a very fine performance, particularly in low fuel consumption.

62. **Bristol.**—These monoplanes were designed for low resistance in fast flight; their gliding angle is good, but still far steeper than would be required to justify an anticipated efficiency so high as 97 per cent. It led, however, to the realisation of 81 per cent. efficiency, than which no machine in the Trials did better. Even this high efficiency was totally inadequate to attain the high speed appropriate to the wings.

If 240 lbs. were taken off the weight in flight, the anticipated efficiency would still remain well over 80 per cent., and this is as much as might reasonably be removed from a machine that only weighs 25 lbs. per h.p. as it now flies under trial conditions.

Larger wings would be necessary to normalise the basic design with the present engine, but the present wings could be normalised by a larger engine if the added weight were sufficiently small, as shown by the aid of the chart.

The official report suggests that these machines should be somewhat lighter or flown without their full load.

63. **Deperdussin.**—The French Dep. monoplane was designed for 78 per cent. ϵ, and realised 79 per cent. efficiency on the basis of a gliding angle of 1 in 5·4. It did not quite realise the speed appropriate to its wings, so, apparently, the reserve power was mainly utilised in overcoming the comparatively high resistance indicated by the gliding angle.

The weight per h.p. in flight of this machine is the least of all those in the table, but the weight per h.p. of the unloaded machine is normal.

The official report considers that allowance for unfavourable conditions should be made in connection with the realised speed of this machine. This would improve its demonstrated efficiency and cause its genuine speed to be appropriate to the wings.

The British Dep. being heavier than the French Dep. anticipated slightly more efficiency than it demonstrated.

The Dep. is an excellent example of high speed monoplane design with well proportioned basic dimensions; it gained the second prize open to the world.

64. **Cody.**—The Cody biplane was designed for 75 per cent. ϵ, and realised 69 per cent. The apparently moderate margin of reserve, however, was sufficient to force the machine up to 72·4 m.p.h. which was just beyond the 71 m.p.h. appropriate to the wings. As the gliding speed was much below the maximum speed, there was a fine natural range of speed, which was still further increased by skilful flying, which reduced the minimum speed 10 m.p.h. below the gliding speed.

Merely as an example of unusual dimensions, the Cody is a singularly interesting biplane design, and its performance thoroughly justified its award of the first prizes open to the world and to British construction.

65. **Maurice Farman.**—The Maurice Farman was designed for an exceptionally low ϵ = 61 per cent., due to the use of very large wings carrying a very low loading. The efficiency realised was 58 per cent., also a low value, and evidently due to the large size of the machine putting an early limit on the maximum speed.

It is interesting to observe that the natural gliding speed is also the minimum speed. There is no other example of a machine in the list that does not have its minimum speed well below the gliding speed. It is clear, therefore, that the object of the Farman design was to be able to fly properly and easily at a very low speed, which it certainly does remarkably well.

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The Zeppelin Scare in Parliament.

ON Monday, in the House of Commons, Mr. Joynson-Hicks asked the Secretary for War whether he could give any information as to a Zeppelin dirigible passing over Sheerness on the night of October 14th, about eight p.m.

Col. Seely: I have communicated with the Admiralty in regard to this matter, and I understand they have no definite information.

Mr. Wheeler: Is it a fact that a report of this occurrence was sent up from Sheerness to the Government?

Col. Seely: No, sir; I would not say there was a formal report stating definitely that the occurrence alleged in the question had taken place. That is not the case. We have made investigations, and we have no definite information as to whether it is a fact or not.

Mr. Joynson-Hicks: Have the Admiralty received any report from Sheerness in regard to the allegation in the question?

Mr. Churchill: I am not aware that any report was received. Inquiries will be made.

Mr. Hucks at Birmingham.

ALTHOUGH a thick fog hung over the flying ground at Castle Bromwich on Saturday, Mr. B. C. Hucks made one or two splendid flights which attracted a large crowd of spectators. The flights were rendered somewhat weird by the fact that to assist Mr. Hucks, a great beacon fire was lit in the centre of the aerodrome, around which he flew. On Saturday week, in one of the three flights made at Castle Bromwich, and which lasted three-quarters of an hour, he succeeded in attaining an altitude of 7,000 ft. At one time he was out of sight for ten minutes, and at another time the wind was blowing so strong that the machine appeared to be quite stationary.

Memorial to Lieut. Hotchkiss.

IN memory of the late Lieut. E. Hotchkiss, the popular Bristol pilot, who, it will be remembered, met his death in an accident during the recent Army Manœuvres, it is proposed to place a stained glass window in Stokesay Church, Salop, in the churchyard of which Mr. Hotchkiss was buried.

FOREIGN AVIATION NEWS.

Military Landing Grounds in France.

THE Association Générale Aeronautique is making good progress with its scheme for arranging flying grounds in various parts of France so that a military aviator may make certain of finding a suitable flying ground within 50 kiloms. of his starting-point, as well as a hangar for housing the machine. A list just published shows that 123 landing places have so far been arranged. In most places the Municipal authorities have welcomed the idea and given every assistance, financially and otherwise, to help forward the project.

An Apt Maurice Farman Pupil.

AFTER six weeks' instruction on a Maurice Farman biplane at Buc, Lieut. Vanduick last week succeeded in qualifying for his superior military *brevet* in three days. His first cross-country test was over a course from Buc to Chartres and Orleans and back, and the second from St. Cyr to Chateau-Renault, Chartres and back.

A Deperdussin Hydro-Aeroplane School.

THE French Deperdussin firm are opening a school for hydro-aeroplane pilots on the Seine just outside Rouen, and Marcel Cavelier has been nominated to take charge of it.

New Deperdussin Military Pilots.

AT the Betheny Aerodrome, near Rheims, on the 12th inst., Lieut. Delagardo made a flight of an hour and a half, and Lieut. Bresson completed a cross-country test from de Vouziers, Mailly Camp to Rheims. Both officers were on Deperdussin monoplanes and qualifying for military *brevets*.

Mme. de Laroche Flying a Sommer.

AT the Sommer School at Mourmelon last week Mme. de Laroche commenced practising on a biplane, and made such good progress that on Monday last she made two good flights over the camp.

High Flying at Sommer School.

ON the 12th inst., at Mourmelon, Lieut. Morel was practising altitude work on his Sommer monoplane, and climbed to 3,500 metres, and two days later he was up to 2,000 metres.

Long Flights on R.E.Ps.

FROM Villacoublay, on the 12th inst., Sergt. Bourkadam was flying on a R.E.P. for 2 hours over Versailles, &c. He made a landing at St. Cyr and then returned to his starting point. Lieut. Delvert, also on a R.E.P., was flying for 1 hr. 45 mins. over Buc, and Lieut. Precardin likewise made a long reconnaissance over the surrounding country.

Touring in the South of France.

HAVING returned from his visit to Spain, Lacombe intends to spend some time in the South of France with his Deperdussin monoplane. On the 15th, he flew from Croix d'Hins to Ste. Livrade and then went on to Toulose. In the evening he returned to Ste. Livrade in an hour and eight minutes.

A Rhone-engined Farman.

ON Saturday last, at Etampes, Fischer was testing a Henry Farman machine fitted with a 9-cyl. Rhone rotary motor, and made one flight of an hour's duration.

Flight "Man-Birds."—VI.

—From the original by Frank M. Williamson.

THE CROSSBILL

Col. Bouttieaux Utilises an Avion.

FOR the first time Col. Bouttieaux on Monday availed himself of the use of an aeroplane to assist him in his official duties. He had to get from Juvisy to St. Cyr, and made the journey in the Breguet biplane piloted by Sapper Bregi.

Aviation in the Balkans.

ONE of the most exciting incidents of the present war in the Balkans is one in which Effimoff was the chief actor. Before the advance of the Bulgarians from Mustafa Pasha to Adrianople, Effimoff flew on an old Blériot over the distance, and distributed a large number of proclamations, printed in the Turkish language, and calling on the people of Adrianople to surrender. The machine was fired at by the Turks, and, although it was 4,000 ft. high, the wings were hit in several places, but not so badly as to prevent Effimoff from flying back 22 miles to the Bulgarian lines. Burri on a Sommer also made a reconnaissance over Adrianople for the besieging Bulgarians. Last Saturday one of the Bulgarian aeroplanes caught fire in mid-air, and the machine fell from a considerable height, both the pilot and the observing officer being, of course, killed.

Padua Aviation Meeting.

SOME good flying was seen at Padua on the 13th inst. by Capt. Bongiovanni and Maniserro on Blériots, and Rossi on a Hanriot. In the morning Capt. Bongiovanni arrived from Pordenone, having done the trip in 59 mins., and he returned by the air-way in the evening.

A Deperdussin in Belgium.

HAVING finished a series of exhibition flights at Anderlues on the 15th inst., Crombez mounted his Deperdussin monoplane and returned to Brussels, taking 40 mins. for the trip.

Touring Denmark on a Biplane.

DURING 15 days M. Birch, who has been flying a Maurice Farman biplane in Denmark, has covered a total distance of about 4,000 kiloms., his wife occupying the passenger's seat throughout the trip.

It was Bad for the Dog.

AFTER about an hour's flight from Doeberitz Camp, on the 12th inst., Lieut. Joly landed 75 kiloms. away, at Stendal, just by the barracks, and a formidable bull-dog belonging to the colonel rushed out to receive the intruder. Unfortunately he ventured too close to the revolving propeller of the Rumpler monoplane, with disastrous results both to himself and to the propeller. The pilot and passenger were, however, unhurt.

Aviation in Roumania.

THE Cotroceni military aerodrome at Bucharest has now been abandoned in favour of the Prince Bibesco's ground. Last week Lieut. Copsa beat the Roumanian height record by going up to 2,000 metres, but two days later Lieut. Zorileans climbed to 2,500 metres. Lieut. Protopopescu has been doing a lot of flying on his Bristol monoplane, and one afternoon gave passenger flights to four Generals.

Aviation in Morocco.

AFTER a very trying trip, which had taken two days, Lieut. Do Hu arrived at Marrakech from Casablanca on his Blériot monoplane, on the 12th inst. He started back two days later, but had to stop at Ben Geurir on account of the fog.

The Tubavion monoplane in flight.

A Spanish Height Record.

AT Barcelona the other day Lacombe beat the Spanish height record by going up to 2,400 metres on his Deperdussin monoplane.

M. Farmans for Japan.

WHILE Maurice Farman was paying one of his usual flying (literally) visits to Etampes, Chartres and Orleans, on the 12th inst., his brother Dick was testing a M. Farman biplane for the Japanese Government. Maurice Farman took a passenger on his trip, and so did M. Barbaroux, who flew in company with him.

The Argentine Height Record.

BY way of honouring their member, Mr. George Newberry, who had raised the Argentine height record to 2,480 metres, the Argentine Aero Club gave a banquet to the aviator on the 13th inst. Representatives of the army and navy were present, and Col. Vallee, in the name of the Minister of War, congratulated Mr. Newberry on his success with his Blériot monoplane.

Deperdussins for South America.

ON the 13th inst. a number of officers from Paraguay visited the Deperdussin School at Rheims, and were so impressed with what they saw that one officer was immediately deputed to commence training. The same day a Chilian officer, Lieut. Avalos, arrived to start his schooling on the two-seater Dep., which has been purchased by his government.

An American Passenger Record.

ON the 12th inst., W. E. Johnson, on a Thomas biplane, accompanied by a passenger, was successful in beating the American passenger duration record, by flying for 3h. 51m. 15s., an improvement of 9 mins. on the old record of G. W. Beatty.

AIRSHIP NEWS.

A Fast Trip by "Hansa."

THE Zeppelin liner "Hansa," on Tuesday, went from Gotha to Potsdam at a fast pace, in spite of a thick fog which rendered the helmsman's task a somewhat difficult one. The time taken for traversing the distance of 155 miles was 3 hrs. and 20 mins., so that the airship averaged a speed of a little over 46 miles an hour. The "Hansa" is to be stationed at Potsdam during the winter, and will be engaged in passenger-carrying trips over Berlin and the vicinity.

More Zeppelins for German Navy.

IT is reported that the German naval authorities intend to order two more Zeppelin cruisers similar to L 1, but with more powerful engines. Their armament will consist of four quick-firing guns as well as bomb-dropping arrangements. It is proposed to make three Naval aviation centres at Kiel, Emden, and Hamburg, each to be equipped with a dirigible and a number of hydro-aeroplanes.

Storm Stops "Adjudant Reau."

ON Monday morning the Astra dirigible "Adjudant Reau" started from Issy for a new station at Verdun, but owing to the heavy rain the dirigible landed at Chalons Camp, where she stayed until the following morning.

Trial With "Adjudant Reau."

ON the 7th inst., "Adjudant Reau," with fourteen people on board, accomplished a fine voyage of two hours and a-half on an out and home course from Issy.

AERONAUTICAL SOCIETY OF GREAT BRITAIN.

Official Notices.

Meetings.—The second meeting of the Society for this session will be held on Wednesday, November 27th, at 8.30 p.m., at the Royal United Service Institution, Whitehall, when Lieut.-General Sir James M. Grierson, K.C.B., C.V.O., will preside. Brig.-General F. G. Stone, R.A., will read a short paper, to be followed by discussion, on "Aircraft as Targets for Artillery and Rifle Practice."

Members are requested to note that under the rules they are permitted to introduce visitors to general meetings.

The third meeting will be held on 11th December, when Mr. E. H. Harper will read a paper on "The Mathematical Theory of Aeroplane Stability."

Students.—Students attending regular science, engineering, or aeronautical courses at recognised technical colleges, as well as those pursuing the scientific side of aeronautics professionally, are eligible for the Students' Section, and should apply immediately if desirous of being admitted *without entrance fee.*

BERTRAM G. COOPER, Secretary.

HYDRO-AEROPLANES.

A POPULAR scientific lecture on the above has been prepared by Mr. V. E. Johnson, M.A., plentifully illustrated with lantern slides, which should prove of considerable help to students of both models and full-sized machines. Mr. Johnson will deliver his lecture, which is divided into two parts, for the first time at the Sheffield Model Aero Club, on November 28th (*see* Model Club Diary for details), and the following is a syllabus :—

Part I.

Hydro-aeroplane defined. Brief history of the same.—Kress, Archdeacon, Blériot, Gabriel Voisin, Fabre, Dr. Barton and Mr. Rawson, Curtiss, Voisin Canard. Monaco and St. Malo meetings. *Various types.*—The river type ; the sea or marine type. *Chief principles involved.*—The hydroplanic ; the aeroplanic. Water resistance and air support. Laws of resistance and support. Area of supporting surface ; how it affects the rising from the surface of the water. The true hydro-aeroplane ; important part played by the float in the (ultimate) solution of the problem. *The floats.*—The model first taken—the hydroplane or gliding boat. The venetian blind type ; why given up by Fabre. The Fabre float ; the Catamaran float ; speed or velocity of skimming and length of float. Effects of length on resistance. Advantages of single (central) float. Balances or wing-tip floats. Stepped floats ; Knight's invention. *A comparison of different float systems* ; lessons from the Monaco meeting. Different systems suitable for rivers and small lakes and for rougher waters, such as the sea. How to cause floats to skim ; speed at which such should commence ; necessity for steady motion ; resistance and the number of floats. Effects of aeroplanic influence on skimming velocity. Length of float and wave formation ; Froude's law ; total resistance and float displacement ; the rear portion of the float ; the best shape.

The construction of the floats.—Wood, framework how joined ; how waterproofed, thickness of wood used, necessity for resilience, watertight compartments.

The eight conditions which floats should satisfy. Relation between flotational capacity and weight of machine. *The attachment of the floats to the machine.*

Part II.

The aeroplane on floats v. *the air boat.* The deciding factor—the chief difficulty to be overcome.

Models—relation between experiments with models and those carried out with full-sized machines—why such experiments are likely to be of value. The minimum size of the model.

Aerial yachting or hydro-aeroplaning as a sport. As an aid to exploration, &c. *In war, a vision of the future.*

[When so desired matter of a more technical character can be substituted for Part II.]

Models

Edited by V. E. JOHNSON, M.A.

Aero Exhibition, Olympia. Model Section.

WE propose in this and the following four articles to deal with the five classes into which the model section will be divided at the forthcoming exhibition at Olympia next February, with a view to being of some slight assistance to those readers of FLIGHT who are thinking of exhibiting. There are certain general conditions to be noted and *carefully thought* over. For instance, in all classes (save 5), it is proposed to assign marks for design and construction; for duration of flight, for stability—in equal quantities—also there is a minimum qualifying duration of flight. It is not compulsory on any exhibitor to be a competitor, but the idea undoubtedly is that they should be such, unless, of course, there are some good reasons to the contrary. Every endeavour will be made on the part of the organisers to get together a thoroughly good and representative collection of scientifically designed models, and we take this opportunity of asking our model readers to do anything and everything that they can to assist in carrying out the scheme.

Many foreigners will undoubtedly visit the Show, in all probability far more than have visited the previous ones, and it will (apart from any other considerations) be an excellent opportunity (far too good to be missed) to show the expert of other nations *what the British model is like*, and a little later, on the flying ground, *what it can do*. With these few remarks we pass on to consider

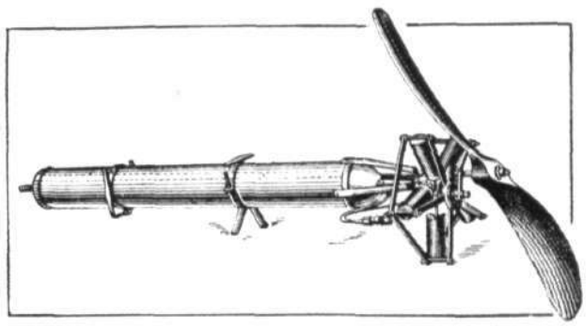
Class I. Power-Driven Models (excluding Rubber and Spring Motors).

The term "power"-driven models is not quite an appropriate one, since all models are driven by *power*. The term "engine"-driven models has been suggested, and is in some respects certainly better, although objections can be urged against this term as against any other.

Probably all readers of FLIGHT understand what is meant by the term "power"-driven models; lest there should be any mistake the words *excluding* rubber and spring motor have been added.

The motive power may then be *any other than rubber or spring*—the reader should carefully note this fact—which does *not* limit the motor to being a steam, petrol, or CO_2 one, as was the case in the "Grahame-White" power-driven competition at Hendon on July 25th last. The prizes have been increased to £12 and £5, either of them well worth winning. A certificate of the performance naturally accompanies all the prizes. As a matter of course this class claims the best prizes, it being both the most difficult for success, and the most expensive to experiment in. The qualifying duration is half a minute; not too long, but quite long enough for the machine to be judged for its stability, and of sufficient duration to necessitate a power plant worth possessing. A 30-sec. *flight* may easily mean the best part of a minute's run by the power plant. A plant which "goes off" with a burst, rushes the machine up into the air at an angle of about 60°, and then more or less rapidly falls off, is scarcely worth any consideration. The reader should also note that no limitations are placed on the *size* of the model or motor in this class. There is, however, a limitation in this way. During the flying test, the competitor takes the risks for any damage done either by or to the model, and the larger the model the greater the possible, not to say probable, damage in either case. It is not essential that the competing model should have been built either in whole or part by the competitor, *i.e.*, the model or the plant, or both, may be bought. In this respect I much regret that I do not know of any really reliable and efficient plant *that is at present on the market*.

The personal experience which I have had with CO_2 plants is not such as to lead me to feel I can really recommend them. They



are very expensive to run, and there appears—at present, at any rate—considerable difficulty in getting the cylinders charged properly. Although, as I stated in a previous issue, there was, properly speaking, no model section at the Paris Aero Show, several firms of model makers were represented. Nearly all had for sale a compressed-air motor, of which I give an illustration. The long tube-like reservoir is intended to serve as the *fuselage* as well, to which the wings, chassis, &c., can be attached; connected with the reservoir is the motor (non-rotary) and the propeller (geared). Several firms showed a similar motor, but without any gear, some a

Two New Zealand aero modellist workers, both members of the Canterbury (N.Z.) Aero Club.—On the left Mr. G. Bolt, holder of the N.Z. duration record, 48 secs. (350 turns on rubber). Mr. Bolt is also famous for his gliding experiments, which will be long remembered in N.Z. On the right Mr. F. O'Connell, holder of the N.Z. distance record, 1,140 ft. This model has been in use for over nine months, has covered over 100 miles, and won the steering, distance, and duration events promoted by the Canterbury Club. The maximum number of turns given to the rubber was 400.

rotary motor. The reservoir is supposed to be charged by means of a foot-pump, in which the ordinary connecting-tube of rubber is replaced by a flexible metal tube to stand the pressure. The motor was shown running connected up to a reservoir of about the same size and weight as are used with an oxy-hydrogen lantern, and under the high pressure there present ran in quite a satisfactory manner. It was in vain, however, that I endeavoured to have the motor shown running from a foot-pumped-up reservoir. I was met with polite excuses. It is claimed for this motor that it was fitted to the model which won the Gordon-Bennett Cup for models in April (I am not quite sure of the month) last with a flight of 175 metres. It is earnestly to be hoped that next year some one from this side of the Channel will go over and "lift" that cup. In the photograph shown at the Exhibition the model was fitted with *two* cylinder reservoirs, one underneath the other—no doubt, very highly charged. The authorities in France do not require so high a factor of safety as we do in England in this respect.

The model was fitted with two propellers and was, if I remember correctly, a tractor monoplane.

Before buying any motor for a model aeroplane, the purchaser should make himself fully acquainted with the following details which he should *insist* on knowing before paying a single penny.

(1) The *complete weight* of the *entire* plant including *all* accessories and fuel.

(2) The average length of run and the requisite fuel to produce such a run.

(3) The actual thrust (static) given by a propeller of the Chauvière or Centrale type, *i.e.*, a propeller and not a fan, although it can, of course, have more than two blades. It would be a good plan, however, to limit it to a two-bladed propeller of such a type as named, or, of course, any *similar* type. *Knowing these facts*, he can at once tell whether the plant is worth anything or not, *otherwise he cannot.*

The competition is for R.O.G. machines; let us assume the rise off surface to be good, and the model well designed, the wings efficient, and the resistance low, then *as the result of practical experience* it may be assumed that if the propeller thrust be one-quarter the *total* weight of the entire model, the machine will rise, and fly, if properly designed and balanced.

Now an aeromodellist should be able to build the machine to carry the plant, so that its weight does not *exceed* that of the plant, *i.e., the propeller thrust should be at least half that of the entire power plant.*

I have supposed the conditions favourable, and the model efficient and the resistance low, taking average results only, we may say that the thrust should be one-third that of the whole machine, or two-thirds that of the plant. Personally I consider the plant should be capable of giving a propeller thrust equal to two-thirds the weight of the entire plant for one minute, and I would not purchase one which would not do this; there should be some margin of power to combat adverse conditions both of the atmosphere and ground. With respect to the design of the model, I should certainly advise a biplane, not a monoplane (I have tried both and prefer the former), with a loading of from 8 to 12 ozs. per sq. ft., not more. The span of the top plane to be somewhat greater than that of the lower.

The reader should not fail to carefully notice the facts quoted in the last issue in the leading article *re* "gap" and "staggered planes." By making the gap equal to 1·6 the chord, and by staggering the planes to the extent of the lower plane being set back 0·4 of the gap, the loss can be reduced to the order of 5 per cent., rather less since the resistance is decreased. Opposed to this there is, of course, some slight increase in weight, provided the vertical distance between the two planes be kept the same in the two cases. Constructionally a biplane is stronger than a monoplane. It is, generally speaking, more convenient for fitting in the power plant, and the reduced span is a great advantage in many ways.

In spite of the difficulties to be overcome in this class, we trust it will be well represented. The winning models will undoubtedly be a source of considerable profit to their owners *apart altogether from the prize money won.*

Mr. Stanger's Petrol Model. A Successful Flight.

Mr. James McBirnie sends us an account of a flight recently witnessed by him on November 3rd. He says, although the new wings had been made quite a month ago, this morning gave the first climatic opportunity of trial. At the first attempt the machine rose after a run of from 15 to 20 yds., rising to an altitude of about 45 ft. Flying quite straight at a very fast speed, the machine soon covered the greater part of our limited flying ground and made direct for the house tops at Bruce Grove, and a collision appeared inevitable when the automatic control switched off the current, the propeller stopped and the machine glided down and alighted as gracefully as any bird. For the next flight Mr. Stanger readjusted the automatic tail-dropping device in order to obtain a quicker rise off, so that an opportunity might be afforded of obtaining a snapshot. Unfortunately, this was overdone, for immediately the tail dropped the machine sprang into the air and practically helicoptered up to about 60 ft. In the resultant dive there was no chance of recovery, and the consequence was a smashed propeller and a broken wing-tip; not very serious considering the weight of the model and the speed of descent.

Mr. Stanger's power plant is well known. He was a competitor in the competition at Hendon on July 25th, but on that occasion the model declined to quit *terra firma*. We congratulate him on his success, but not on his tail-dropping device, which has always seemed to us unnecessary and, as this result shows, sometimes disastrous.

"Flight" Prizes of Merit.

In reply to several correspondents, we beg to state that there is no age limit—octogenarians please note.

Replies in Brief.

A. C. BARLOW.—Impossible at present. From personal experience we cannot recommend this type of motor, unless at least of 1-h.p., and even then the expense of running is considerable.

T. A. BARLOW (Shrewsbury).—We have your letter to hand, but regret being unable to trace the scale drawings you mention. Every drawing sent should bear the sender's name on the back.

E. T. SIMPSON.—In reply to query (2) from any good drapers, or if proofed from Mr. G. P. Bragg-Smith. (1) We should suggest binding, shall be pleased to receive results.

C. C. HORNER.—Your letter and drawings received, same shall appear in due course.

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KITE AND MODEL AEROPLANE ASSOCIATION.

Official Notices.

British Model Records.

Hand-launched	Distance	A. E. Woollard	...	477 yards.
	Duration	A. F. Houlberg	...	89 secs.
Off ground ...	Distance	G. Rowlands...	...	232 yards.
	Duration	A. F. Houlberg	...	51 secs.
Hydro, off water ...	Duration	G. P. Bragg-Smith ...		25 secs.
Single-tractor screw, hand-launched ...	Distance	H. R. Weston	...	84 yards.
	Duration	F. W. Jannaway	...	22 secs.

Membership.—The membership of the association is being added to weekly, but all members are asked to do their utmost to introduce at least one new member before the end of the year. For Members elected now the subscription carries membership till January, 1914.

Aero Show, Olympia.—The full details are published on page 1,079, and all clubs and members will have complete set of rules, &c., forwarded to them.

27, Victory Road, Wimbledon. W. H. AKEHURST, Hon. Sec.

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MODEL CLUB DIARY AND REPORTS.

CLUB reports of chief work done will be published monthly for the future. Secretaries' reports, to be included, must reach the Editor on the last Monday in each month.

Aero-Models Assoc. (N. Branch) (15, HIGHGATE AVENUE, N.).
NOVEMBER 23RD. Flying at Finchley, to include trials for next Saturday's monthly competition. Also illuminated flying at dusk.

Bristol and West of England (CLIFTON DOWN HOTEL, CLIFTON).
NOVEMBER 30TH. Hydro-aeroplane, hydroplane and model yacht meeting at 3 p.m., at Zoological Gardens. A boat will be provided on the lake. Usual charge for admission.

Hendon Model Aero Club (8, MONTAGU ROAD, W. HENDON).
NOVEMBER 23RD. Duration contest (postponed from 16th), November 30th, monthly best flight contest (3rd round).

Leytonstone and Districts Aero Club (64, LEYSPRING ROAD).
NOVEMBER 23RD. Flying, 3 p.m., opposite brickfields. November 24th Near Bushwood Avenues, 10 a.m.

Reigate, Redhill and District (8, BRIGHTON ROAD).
NOVEMBER 23RD. R.o.g. and tractor trials. November 24th. Flying at "Wiggie."

Scottish Ae.S. ("ROCHELLE," LIMESIDE AVENUE, RUTHERGLEN).
NOVEMBER 23RD. Hydro-aeroplane competition, Alexandra Park. November 30th. Tractor competition (sweepstake), Maxwell Park. December 7th. Rising from ground competition, Paisley Racecourse. December 14th. Hydro-aeroplane meeting, Maxwell Park.

Sheffield Model Aero Club (35, PENRHYN ROAD, SHEFFIELD).
NOVEMBER 28TH. Special lecture, at 8 p.m. (illustrated with lantern-slides), on Hydro-aeroplanes, by Mr. V. E. Johnson, M.A., at St. Paul's Schoolrooms. Cambridge Street. Admission 1s., 9d., and 6d.; members free. Chairman: Mr. E. W. Colver.

Windsor Model Aero Club (10, ALMA ROAD, WINDSOR).
NOVEMBER 23RD. Hydro-aeroplane flying, Home Park, 2.30.

CORRESPONDENCE.

*** *The name and address of the writer (not necessarily for publication)* MUST *in all cases accompany letters intended for insertion, or containing queries.*

Correspondents communicating with regard to letters which have appeared in FLIGHT, would much facilitate ready reference by quoting the number of each letter.

Stream-Line Bodies.

[1671] There seems to be much difference of opinion about stream-line bodies. It is the opinion of some that the perfect stream-line form is more or less cigar-shaped, or like a submarine, Fig. 1.

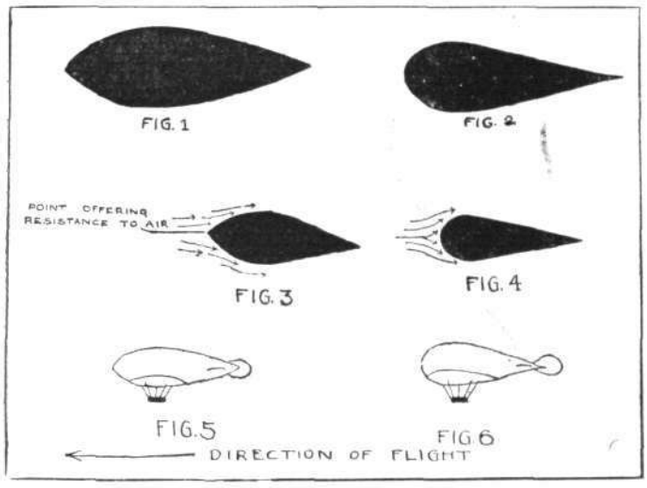
Now my idea of stream-lining, and that of many others, is *curved* in front and tapering to a point behind, Fig. 2.

Some say that it is obvious that less resistance is offered in Fig 1, but I am of the opinion that the point is an obstacle causing head-resistance. Now in Fig. 2, air striking the curved surface in front is evenly distributed with no obstacle, as the point in Fig. 1 to offer resistance, and thus glides over the bulb as it were, in front, to the tail. The arrows in Fig. 3 show the curve the air would take when a body shaped as in Fig. 1 is driven through it.

And in Fig. 4, the air striking a body shaped as in Fig. 2, would take the course shown in Fig. 4.

Now comes the question. Would the reader, if constructing an aeroplane, make his strut section as in Fig. 1 or as in Fig. 2?

As I stated before, I consider Fig. 2 is the better. There is one



other point, however. It would appear that a dirigible with an envelope shaped as in Fig. 5, would go faster than one of the same cubic capacity, with an envelope as in Fig. 6. Now if this was so (it has to be proved by scientists, I believe) an envelope, as in Fig. 6, gives greater stream-line, a dirigible with a pointed front would go faster than a perfect stream-line dirigible. I should like to know the readers' opinions, as this appears to be impossible. Yet a dirigible with an envelope as in Fig. 5 has an appearance of being faster than one with an envelope as in Fig. 6.

Furthermore, if a curved surface gives less resistance than a pointed one, why are not submarines made with hemispherical fronts.

If it is not expecting too much, I should like your readers' opinions upon this interesting subject.

W. Folkestone. M. L. ROBINSON.

Momentum in Air.

[1672] As the above problem is still being discussed, may I be allowed to put forward my view, the problem being that an aeroplane is flying against a wind having a velocity equal to its own, and thereby remaining stationary relatively to the earth. What will happen when the wind and engine-power are simultaneously cut off?

The aeroplane under such conditions has four forces acting upon it. (1) A vertical downward force equal to the weight of the machine. (2) A vertical upward force equal to (1), and being the vertical component of the force acting on the machine due to the passage of wind past the planes, &c. (3) A horizontal forward force produced by the engine. (4) A horizontal backward force equal to (3), and being the horizontal component of the force produced by the passage of wind past the planes, &c. When the wind and engine are simultaneously cut off, the equal horizontal opposing forces are immediately removed, and likewise the vertical upward force, and consequently forces (2), (3) and (4) are cut off, and force (1) is left to act alone and along its own path. That is, the machine will immediately start to move vertically downwards.

If the propeller is situated at the rear of the machine, the problem may be regarded as follows:—A body is held stationary above the earth and between two equal opposing horizontal forces, such as being pinched between finger and thumb. Then there are the four forces acting upon it. (1) Vertically downwards, weight. (2) Vertically upwards, through being held. (3) and (4) Forward and rearward pressures. If now the finger and thumb producing forces (2), (3) and (4) be suddenly removed, the forces neither remain behind, *nor leave behind them any effect of their previous presence* (except that if the horizontal pressures were sufficiently great to partially crush the body, it would then expand to its normal proportions), that is, the vertical downward force will be left to act *entirely* alone, which will cause the body to move vertically downwards, or in other words, to fall to the ground.

To put the matter in a nutshell: if a body is lifted a certain height, pinched, and then all *exterior* forces taken away, it will fall to the ground, proving that it has no *interior* force giving it momentum one way or the other.

Crewe. C. W. SLINGO.

[1673] I hope you will let me contribute this, my theory of "Momentum in Air," to the discussion you have initiated. I propose first to refer to the usual "fly in a train," and then apply the formulæ of simple dynamics to satisfy the theories invoked.

If a fly was moving aft in a train at the train's speed, so as to keep stationary over the ground, and then the train was to suddenly stop, the fly would not move forward or aft in the train but remain stationary over the ground as it was before. Be careful here to avoid confusing the propulsive effort of the fly's wings after the train has stopped with the momentum of the fly due to its motion before the stoppage. To realise this more easily, imagine the effect of a sudden stoppage on a fly keeping stationary with regard to the carriage, its momentum would clearly cause it, as well as everything else, to move forward in the carriage.

Of course, the above is analogous to the example of the aeroplane keeping stationary over the ground in a wind, with the wind suddenly stopping (and the motor as well).

For experimental purposes, the air in a train is a wind when the train is in motion, and a calm when the train is stopped.

So far, you will have seen, I agree with FLIGHT.

Now consider the fly while flying round the carriage. By the theory expressed in the FLIGHT article, the fly has more kinetic energy when travelling forward than when travelling aft in the carriage, and should therefore rise while turning to go aft, and *vice versa*. This is surely contrary to common sense, and I hope to prove that it is not so.

As we are only considering the effects of momentum and not losses caused by the inefficiency of the aeroplane with its helm over, skin friction losses, &c., to avoid confusion of thought I will substitute for the aeroplane a sphere fitted with a fore and aft keel-plane and rudder, but offering, with its rudder amidships, no aerodynamic or frictional resistance to forward motion. Moreover, this contraption must displace its own weight in the air so as to float without a tendency to fall or rise. I think you will allow this as a fair substitution.

Let us consider this sphere, having initial momentum given to it, turning through 180 degrees in a calm. While turning the sphere's keel-plane presses outward on the surrounding air. Without going into the theory of pressures on the rudder and keel-plane, I can assert this as due to centrifugal force. Perhaps this may be more easily understood by imagining the turn to be made so quickly that the sphere may be considered to be rebounding from a cushion of air. Of course, the air will feel the blow.

In either case a certain mass of air will be given a velocity outwards. In a 180° turn these velocities may be all compounded into one velocity in the direction of original motion. The energy needed to create this velocity must be abstracted from the sphere, hence the sphere will go slower after the turn than before it. It will be shown that this loss is greatly altered in a wind, and can even be changed to a gain in the case of a turn from up wind to down.

However, the ultimate form of this lost energy is heat, when the air velocity is dissipated in eddies and frictional resistance.

Now for figures.

Let A represent the mass of the aeroplane, M the mass of the air effected, V the velocity of the aeroplane before a turn, V^1 the velocity after.

All momentums, velocities, &c., are relative to the ground.

The momentum of the aeroplane before the turn = AV
" " air " = O
" " aeroplane after the turn = $-AV^1$
$\therefore$ " " air " = $AV - AV^1$
$\therefore$ the velocity " air " = $\frac{A}{M}(V - V^1)$ (i)

Also the K.E. lost to the aeroplane = $\frac{1}{2}A(V^2 - V^{12})$

and the K.E. gained by the air = $\frac{1}{2}M\left\{\frac{A}{M}(V - V^1)\right\}^2$

$\therefore \quad \frac{1}{2}M(V^2 - V^{12}) = \frac{1}{2}M\frac{A^2}{M^2}(V - V^1)^2$

$\therefore \quad M(V - V^1) = A(V + V^1)$ (ii)

Now I am going to show that if the aeroplane in a wind of any velocity (v) behaves exactly relatively to the air as it does in a calm, then the energy given to the air (considered relatively to the ground) is equal to tho energy lost by the aeroplane (considered relatively to the ground). So shall my theory be satisfied.

The velocity of the wind is v, and the aeroplane makes a 16 point turn from down wind and up wind.

The velocity of the aeroplane down wind is $(V + v)$.
" " up " $(-V + v)$.

The velocity given to the mass M, relatively to the ground $= v + \frac{A}{M}(V + V^1)$.

As in a calm, the sum of the momenta before and after the turn of the aeroplane and mass, M, are the same.

And also :—

The K.E. of the aeroplane down wind = $\frac{1}{2}A(V + v)^2$
" " up " = $\frac{1}{2}A(-V^1 + v)^2$
" mass M before turn = $\frac{1}{2}Mv^2$
" mass M after turn = $\frac{1}{2}M\left\{v + \frac{A}{M}(V + V^1)\right\}^2$

It can be shown that the K.E. lost by the aeroplane is equal to that gained by the mass M (using equation II), but that proof I will spare you. I think I have done enough to show that by considering the displaced mass of air, M, a theory can be evolved that satisfies equations of K.E. on momentum whether these be considered relative to the ground or air, although, perhaps, I have established no absolute proof. I also put it to you that in Newton's laws of motion, "motion" is always relative to sun, moon or stars, or anything.

Finally, if you still adhere to your theory, I ask you to work out the fall of a 60 m.p.h. aeroplane in feet when turning in a 30 m.p.h. wind from up wind to down wind.

Harwich. JASKO.

Red Lights for Night-flying.

[1674] Referring to the Night-flying Exhibition at Hendon last Saturday week and the unfortunate accident to Mr. Gates, may I suggest that the latter incident might possibly have been prevented by a few red lamps placed on the fence marking the boundary of the aerodrome, and also on dangerous objects, such as trees, just without the boundary. The pilot might then be able to guide his machine clear of such objects or keep within the flying ground.

Finchley, November 13th. ARTHUR T. DOEG.

Balloon Records (1668 and 1669).

[1675] Your correspondent apparently quotes me as saying that Glaisher and Coxwell's balloon "reached an elevation of (about) 37,000 ft., or fully seven miles." If anyone will refer to my book, "Aerial Navigation of To-day," he will see that the paragraph in question is quoted from Glaisher's "Travels in the Air."

I particularly pointed out that Glaisher's instruments were not so reliable as those in use by balloonists of the present day. At the same time, although Süring and Berson undoubtedly hold the record, I entirely dissent from the view that Glaisher and Coxwell went no higher than 31,000 ft. The matter is not important, however, for the exact height being unknown, it cannot count in official records.

[Those interested ought to read Glaisher's complete account.]

November 16th. CHARLES C. TURNER.

[1676] Your correspondent, Mr. C. A. K. Cox (letter 1657), will find a full account of Messrs. Coxwell and Glaisher's balloon ascents in the year 1862 in Irving's *Annals of Our Time*, page 628, and also in the *Chronicles of the Annual Register* of 1862, page 144, under date July 17th. In the latter book there is a long account of the several ascents they made; the greatest height which they were able to record was 35,000 ft., but the balloon may have gone higher.

Aylesbury. HUBERT BEAUMONT.

Another Irish Monoplane Tested.

HAVING completed the monoplane which he has built himself at Coolnamuck, Clonmel, M. Jurgens spent some time last week testing the engine, and on Friday evening made his first flight. Rising easily, the machine is reported to have flown at a good height for several hundred yards, and then landed in splendid style. Arrangements have been made for M. Jurgens to give exhibitions at Clonmel.

A Record with Continental Fabric.

THE record flight made by Von Gorrison the other day, at Johannisthal, with five passengers, speaks well for the "Continental" aeroplane sheeting with which his A.G.O. biplane was covered.

Integral Propellers in Africa.

WRITING to the Integral Propeller Co., whom he now represents in South Africa, Mr. C. Compton Paterson says :—"I might mention that my 500-mile flight across Central South Africa was successfully completed without mishap of any kind on a Paterson biplane, fitted with the original Chauvière propeller I have used throughout my tour, which has comprised visits to Capetown, Kimberley, Johannesburg, Durban, and many other smaller up-country towns. This propeller is standing up to its work in spite of its constant exposure to broiling sun, and very often heavy rains."

Clothing for Flyers.

WE learn from Aeronautical Accessories, of 39, St. James' Street, S.W., that they are now in a position to undertake the outfitting of aviators literally from head to foot, and moreover to the complete satisfaction of their clients. It is well known that they are sole selling agents for the Warren Patent Safety Helmet and also that they are turning out an exceedingly useful leather overall lined with fleece throughout, while a similarly lined and very comfortable soft leather top boot is a speciality. Among other aerial necessities that we understand they are stocking are rainproof gauntlets, ordinary gauntlets, sweaters with double-knitted chest, mufflers, rubber top boots, &c. They also have some special goggles made of clear, unbreakable, uncrackable, non-inflammable material, made in two forms, one specially to clip on the Warren helmet, and the other to be worn in the ordinary way without helmet.

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